IDAHO

DEPARTMENT OF FISH AND GAME

Jerry M. Conley, Director

FEDERAL AID TO FISH AND WILDLIFE RESTORATION

Job Performance Report

Project F-71-R-9

REGIONAL FISHERY MANAGEMENT INVESTIGATIONS

Job I-a. Region 1 Mountain Lakes Investigations
Job I-b. Region 1 Lowland Lakes Investigations
Job I-c. Region 1 River and Stream Investigations
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by

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Job Number I-d. Region 1 Technical Guldance

JOB PERFORMANCE REPORT

State of: Idaho

Project No.: F-71-R-9

Job No.: Job I-a

Name: REGIONAL FISHERY MANAGEMENT INVESTIGATIONS

Title: Region 1 Mountain Lakes Investigations

Period Covered: 1 January 1984 to 31 December 1984

ABSTRACT

During 1985, management personnel coordinated with the Forest Service, hatcheries and sportsmen to manage mountain lakes in Region 1. A trend toward diversification was contlnued with releases of westslope cutthroat and domestic Kamloops rainbow. Mountain lake releases In the region are summarized for the last eight years.

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RECOMMENDATIONS

1. Evaluate survival and growth of fish in mountaln lakes when stocked at densities of 250 fish/acre.

2. Determine best size and time to release fry in mountaln lakes. Coordinate management needs Into hatchery programs.

3. Follow recommendations in Table 1 regarding even or odd year stocking. Stock lakes that have been mlssed for several years and temporarily discontinue stocklng lakes where stunted *fish* populations are known to exist.

4. Continue cooperative program with USFS District and supervisor's office fishery personnel to survey mountain lakes and draft management programs (collection and analysis of age and growth Information on fish populations and determination of angler preferences should receive priorlty consideration).

5. Continue species diversIty program by utillzing westslope cutthroat and Kamloops rainbow. The bureau should make every effort to obtain grayling and golden trout so unlque mountain lake fisheries can become a reality.

6. Evaluate brown trout control of stunted brook trout populations.

OBJECTIVES

Develop improved management plans for fish populations of mountain lakes in Region 1.

Evaluate selected mountain lakes, their fish populations, angler satisfaction and preferences. Use new and existing information on angler use, water quallty, species hlstory, spawning potentlal, stocklng success and lake morphology to develop the potential of these waters for providing diverse angling experiences.

TECHNIQUES USED

Information on mountain lakes in Region 1 was reviewed with hatchery personnel and individuals from other agencies and groups to coordinate releases of fish in 1984. The stocking program was based on previous history, reports of fishing quality and availability of fish for release in 1984.

FINDINGS

In 1984, seven lakes were stocked with westslope cutthroat fry, seven were stocked with domestic Kamloops fIngerIIngs, four were stocked with catchable rainbow and one was stocked with brook trout (Table 2). Stocking historIes for all mountain lakes in Region 1 are summarized in Table 1 for the period 1977-1984.

Limited information from several mountain lakes surveyed by hatchery personnel and anglers In 1984 indicate that age 2+ Kamloops are approximately 10 to 15 cm in length and age 5+ fish are 25 to 30 cm in length. We do not have enough specific information to indicate how this compares to growth of westslope cutthroat. An evaluation of the new 250 fry/acre stocking rate will probably not be valid until approximately 1988 based on the presumed age of the larger fish in the catch.

In 1984, the stocking schedule for Region 1 mountain lakes was again revised. The new schedule (Table 2) balances the number of each species of fish and the number of lakes to be stocked each year. Species diversity will be maintained by utilizing westslope cutthroat and domestic Kamloops rainbow for most lakes, golden and grayling (when available) for specialty lakes and brown trout for attempted control of stunted brook trout. We are no longer stocking any rainbow in mountain lakes in the Pend Oreille drainage to avoid diluting the wild Kamloops gene pool, and we will only stock westslope cutthroat in lakes specified for cutthroat.

Table 1. Odd and even year stocking schedule for mountain lakes in Region 1.

Lake	Code no.	Surface acres	No. stocked	Species	Substitute species
		ODD YEAR SCHEDULE			
Kootenai					
Hidden	01-103	50	12,500	C2	K1
Lake Mtn.	01-104	7	1,750	C2	None
West Fork	01-109	12	3,000	K1	C2
Long Mtn.	01-112	3	1,500	GR	None
Parker	01-113	3	1,000	GN	None
Smith	01-115	6	3,000	GR	None
Big Fisher	01-117	10	2,500	C2	None
Myrtle	01-122	20	5,000	C2	None
Trout	01-124	7	1,750	K1	C2
Pyramid	01-125	11	2,750	K1	C2
Snow	01-134	10	2,500	C2	None
Roman Nose #3	01-137	12	3,000	K1	C2
Solomon	01-146	9	2,250	C2	K1
Spruce	01-147	5	1,250	K1	C2
Pend Oreille					
Hunt	02-101	12	3,000	C2	None
Standard	02-103	16	4,000	C2	None
Two Mouth #2	02-107	5	1,250	C2	None
Mollies	02-114	2	500	C2	None
Fault	02-121	6	1,500	C2	None
McCormick	02-122	3.1	775	C2	None
Beehive	02-128	7	1,750	C2	None
Harrison	02-129	29	7,250	C2	None
Dennick	02-171	8	2,000	C2	None
Sand	02-172	5	1,250	C2	None
Bloom	02-173	20	5,000*	BK *Size 2	None
Caribou (near Keokee Mtn.)	02-196	6.8	1,700	C2	None
Spokane					
Gold	03-124	3	750	K1	None
Crater	03-133	5	2,500	GR	None
Bacon	03-144	9	2,250	C2	None

Table 1. Continued.

Lake	Code no.	Surface acres	No. stocked	Species	Substitute species
		ODD YEAR SCHEDULE			
Forage	03-146	13	3,250	GN	None
Halo	03-147	12	3,000	C2	None
Crystal	03-160	10	2,500	C2	None
Little North Fork Clearwater					
Mud	06-118	6	1,500	K1	None
Skyland	06-125	13	3,250	K1	None
No Seeum	06-130	4	1,000	C2	None
Steamboat	06-131	9	4,500	GR	None
Copper	06-201	3	750	C2	None
Silver	06-205	10	2,500	K1	None

Total number of fish to be stocked:

C2 - 60,975
K1 - 19,750
GR - 11,500
GN - 4,250
BK - 5,000 Size 2

Table 1. Continued.

Lake	Code no.	Surface acres	No. stocked	Species	Substitute species
		EVEN YEAR SCHEDULE			
Kootenai					
Hidden	01-103	50	12,500	K1	C2
West Fork	01-109	12	3,000	C2	K1
Long Mtn.	01-112	3	1,500	GR	None
Parker	01-113	3	1,000	GN	None
Smith	01-115	6	3,000	GR	None
Trout	01-124	7	1,750	C2	K1
Pyramid	01-125	11	2,750	C2	K1
Ball Creek	01-126	6	1,500	C2	None
Little Ball Cr.	01-127	4	1,000	C2	None
Roman Nose #3	01-137	12	3,000	C2	K1
Solomon	01-146	9	2,250	C2	K1
Spruce	01-147	5	1,250	C2	K1
Queen	01-148	5	1,250	C2	None
Copper	01-154	5	1,250	C2	None
Callahan	01-166	10	2,500	C2	None
Estelle	01-167	5	1,250	BN	None
Pend Oreille					
Hunt	02-101	12	3,000	C2	None
Two mouth #3	02-108	20	5,000	C2	None
Caribou (near West Fk Mtn)	02-116	6.8	1,750	C2	None
Little Harrison	02-126	6.5	1,625	C2	None
Harrison	02-129	29	7,250	C2	None
Beaver	02-130	5	1,250	BN	None
Dennick	02-171	8	2,000	C2	None
Sand	02-172	5	1,250	C2	None
Bloom	02-173	20	5,000*	BK* Size 2	None
Moose	02-185	16.5	4,200	BN	None
Caribou (near Keokee Mtn.)	02-196	6.8	1,700	C2	None

Table 1. Continued.

Lake	Code no.	Surface acres	No. stocked	Species	Substitute species
		EVEN YEAR SCHEDULE (CONTINUED)			
Spokane					
Crater	03-133	5	2,500	GR	None
Forage	03-146	13	3,250	GN	None
Crystal	03-160	10	2,500	C2	None
Little North Fork Clearwater					
Devils Club	06-113	4	1,000	C2	None
Larkins	06-117	12	3,000	C2	None
Hero	06-119	4	1,000	C2	None
Heart	06-122	40	10,000	K1	none
Northbound	06-123	12	3,000	C2	None
Fawn	06-126	13	3,250	C2	None
Steamboat	06-131	9	4,500	GR	None
Gold	06-202	8	2,000	C2	None
Tin	06-204	3	750	K1	None

Total number of fish to be stocked:

C2 - 60,825
K1 - 23,250
GR - 11,500
GN - 4,250
BK - 5,000 Size 2
BN - 6,700

Table 2. Number and species of fish (fry except where noted) stocked into mountain Lakes in Region 1 from 1977-1984.

Drainage	Lake	Surface acres	Year stocked	Number stocked	Stocking rate (fish/acre)	Stock of fish	Comments
Kootenai	Hidden (1-103)	50	1977	5,800	232	Henrys Lake cutthroat	
			1979	5,486	109	Henrys Lake cutthroat	
			1979	5,300	106	Kamloops rainbow	
			1981	15,922	318	Westslope cutthroat	
			1982	15,656	313	Kamloops rainbow*	
			1983	12,107	242	Henrys Lake cutthroat	
			1984	12,768	255	Kamloops rainbow	
	Lake Mountain (cuttoff) (1-104)	7	1977	2,910	416	Henrys Lake cutthroat	
			1979	3,424	346	Henrys Lake cutthroat	
			1983	1,723	246	Henrys Lake cutthroat	
	West Fork (1-109)	12	1978	7,704	642	Henrys Lake cutthroat	
			1979	3,184	265	Kamloops rainbow	
			1981	6,704	559	Westslope cutthroat	
			1982	3,648	304	Kamloops rainbow	
			1983	3,016	251	Henrys Lake cutthroat	
			1984	3,010	251	Kamloops rainbow	
	Long Mountain (1-112)	3	--	--	--	Grayling	
	Parker	3	1979	2,220	740	Golden trout	
	Smith (Long Canyon) (1-115)	6	--	--	--	Grayling	
	Big Fisher (1-117)	10	1977	6,295	630	Henrys Lake cutthroat	
			1979	3,030	303	Henrys Lake cutthroat	
			1981	3,352	335	Westslope cutthroat	
			1983	2,486	248	Henrys Lake cutthroat	

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Table 2. Continued.

Drainage	Lake	Surface acres	Year stocked	Number stocked	Stocking rate (fish/acre)	Stock of fish	Comments
Kootenai	Myrtle (1-122)	20	1977	6,240	312	Henrys Lake cutthroat	
			1979	6,060	303	Henrys Lake cutthroat	
			1983	5,189	259	Henrys Lake cutthroat	
	Trout (1-124)	7	1977	2,562	366	Kamloops rainbow	
			1979	2,120	303	Kamloops rainbow	
			1981	2,514	359	Westslope cutthroat	
			1982	3,296	471	Kamloops rainbow	
			1983	1,720	247	Henrys Lake cutthroat	
			1984	1,733	248	Kamloops rainbow	
	Pyramid (1-125)	11	1977	3,660	333	Kamloops rainbow	
			1977	81	7	Henrys Lake cutthroat	
			1979	3,710	337	Kamloops rainbow	
			1981	4,190	381	Westslope cutthroat	
			1982	3,296	300	Kamloops rainbow	
			1983	2,702	246	Henrys Lake cutthroat	
			1984	2,736	249	Kamloops rainbow	
	Ball Creek (1-126)	6	1978	3,184	531	Henrys Lake cutthroat	
			1980	2,136	356	Westslope cutthroat	
			1083	1,513	255	Henrys Lake cutthroat	
			1984	1,000	167	Westslope cutthroat	
	Little Ball Creek (1-127)	4	1980	1,424	356	Westslope cutthroat	
			1984	1,500	375	Westslope cutthroat	
	Snow (1-134)	10	1978	3,184	318	Henrys Lake cutthroat	
			1979	3,030	303	Henrys Lake cutthroat	
			1982	3,008	301	Westslope cutthroat	
			1983	2,872	287	Henrys Lake cutthroat	
	Roman Nose #3 (1-137)	12	1977	2,080	168	Catchable rainbow	
			1977	3,072	256	Henrys Lake cutthroat	
			1978	3,360	280	Henrys Lake cutthroat	
			1979	5,300	442	Kamloops rainbow	
			1983	2,320	193	Domestic Kamloops (size 2)	

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Table 2. Continued.

Drainage	Lake	Surface acres	Year stocked	Number stocked	Stocking rate (fish/acre)	Stock of fish	Comments
Kootenai	Solomon (1-146)	9	1977	3,120	347	Henrys Lake cutthroat	
			1978	4,704	523	Henrys Lake cutthroat	
			1979	5,062	562	Kamloops rainbow	
			1982	3,040	338	Kamloops rainbow	
			1983	2,162	240	Henrys Lake cutthroat	
			1984	2,268	252	Kamloops rainbow	
	Spruce (1-147)	5	1977	6,292	1,258	Henrys Lake cutthroat	
			1978	5,136	1,027	Henrys Lake cutthroat	
			1980	2,509	502	Westslope cutthroat	
			1982	2,432	486	Kamloops rainbow	
			1983	1,297	259	Henrys Lake cutthroat	
			1984	2,520	504	Kamloops rainbow	
	Queen (1-148)	5	1978	3,184	637	Henrys Lake cutthroat	
			1980	1,770	354	Westslope cutthroat	
			1983	1,296	259	Henrys Lake cutthroat	
	Copper (1-154)	5	1978	2,016	403	Henrys Lake cutthroat	
			1980	2,091	418	Westslope cutthroat	
			1983	1,297	259	Henrys Lake cutthroat	
			1984	1,390	278	Westslope cutthroat	
	Callahan (Smith) (1-166)	10	1978	2,688	269	Henrys Lake cutthroat	
			1979	3,636	364	Henrys Lake cutthroat	
			1984	2,500	250	Westslope cutthroat	
Pend Oreille	Hunt (2-101)	12	1977	4,000	333	Golden trout	
			1979	3,180	265	Kamloops rainbow	
			1982	3,648	304	Kamloops rainbow	
	Standard (2-103)	16	1978	7,074	442	Henrys Lake cutthroat	
			1980	5,472	342	Westslope cutthroat	
			1983	4,021	251	Henrys Lake cutthroat	
	Two Mouth #1 (2-106)	?	1979	2,456	—	Henrys Lake cutthroat	
			1981	2,258	—	Westslope cutthroat	

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Table 2. Continued.

Drainage	Lake	Surface acres	Year stocked	Number stocked	Stocking rate (fish/acre)	Stock of fish	Comments
Pend Oreille	Two Mouth #2 (2-107)	5	1979	2,456	491	Henrys Lake cutthroat	
			1981	2,258	452	Westslope cutthroat	
			1983	2,054	411	Henrys Lake cutthroat	
	Two Mouth #3 (2-108)	20	1977	9,444	472	Henrys Lake cutthroat	
			1979	6,140	307	Henrys Lake cutthroat	
			1981	6,774	339	Westslope cutthroat	
			1983	4,973	249	Henrys Lake cutthroat	
			1984	5,280	264	Westslope cutthroat	
	Mollies (2-114)	2	1978	2,016	1,008	Henrys Lake cutthroat	
			1981	3,352	1,672	Westslope cutthroat	
			1983	648	324	Henrys Lake cutthroat	
	Caribou (near West Fk. Mtn) (2-116)	6.8	1980	2,052	302	Westslope cutthroat	
			1984	1,752	258	Henrys Lake cutthroat	
	Fault (Hunt Peak #1) (2-121)	6	1978	2,016	336	Henrys Lake cutthroat	
			1979	3,184	531	Kamloops rainbow	
			1981	2,258	376	Westslope cutthroat	
			1983	2,872	478	Henrys Lake cutthroat	
	McCormick (Hunt Peak #2) (2-122)	3.1	1977	2,544	821	Henrys Lake cutthroat	
			1979	1,592	513	Kamloops rainbow	
			1981	2,258	728	Westslope cutthroat	
	Little Harrison (2-126)	6.5	1977	3,148	484	Henrys Lake cutthroat	
			1979	2,424	373	Henrys Lake cutthroat	
			1981	2,258	347	Westslope cutthroat	
			1983	1,651	254	Henrys Lake cutthroat	

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Table 2. Continued.

Drainage	Lake	Surface acres	Year stocked	Number stocked	Stocking rate (fish/acre)	Stock of fish	Comments
Pend Oreille	Beehive (2-128)	7	1977	3,148	450	Henrys Lake cutthroat	
			1979	2,424	346	Henrys Lake cutthroat	
			1981	2,258	323	Westslope cutthroat	
			1983	1,723	246	Henrys Lake cutthroat	
	Harrison (2-129)	29	1978	10,272	354	Henrys Lake cutthroat	
			1979	3,184	110	Kamloops rainbow	
			1981	9,218	318	Westslope cutthroat	
			1982	6,972	240	Kamloops rainbow	
			1983	7,243	250	Henrys Lake cutthroat	
			1984	7,296	250	Kamloops rainbow	
	Beaver (2-130)	5	1977	3,840	770	Brook trout	
			1980	1,936	387	Brook trout	
	Dennick (2-171)	8	1977	3,144	393	Henrys Lake cutthroat	
			1978	2,568	321	Henrys Lake cutthroat	
			1980	2,509	314	Westslope cutthroat	
			1981	5,800	725	Westslope cutthroat	
			1983	1,939	242	Henrys Lake cutthroat	
			1984	2,060	258	Westslope cutthroat	
	Sand (2-172)	5	1977	2,096	419	Henrys Lake cutthroat	
			1978	3,184	637	Henrys Lake cutthroat	
			1980	2,509	502	Westslope cutthroat	
			1981	3,480	696	Westslope cutthroat	
			1982	8,360	1,672	Kokanee	
			1983	1,221	244	Henrys Lake cutthroat	
			1984	1,254	251	Westslope cutthroat	
	Bloom (2-173)	20	1977	7,852	392	Brook trout	
			1978	10,304	515	Brook trout	
			1979	13,680	684	Westslope cutthroat	
			1981	24,402	1,220	Brook trout	
			1982	10,620	531	Brook trout	
			1984	5,041	252	Brook trout	

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Table 2. Continued,

Drainage	Lake	Surface acres	Year stocked	Number stocked	Stocking rate (fish/acre)	Stock of fish	Comments
Pend Oreille	Porcupine (2-182)	13	1977	1,040	80	Catchable rainbow	
			1978	2,000	154	Catchable rainbow	
			1979	4,200	323	Catchable rainbow	
			1979	4,560	351	Kamloops rainbow	
			1980	4,440	342	Catchable rainbow	
			1982	1,296	100	Kamloops rainbow	
			1983	2,872	220	Domestic Kamloops (size 2)	
			1984	1,016	78	Catchable rainbow	
	Antelope (2-190)	16	1977	4,000	250	Catchable rainbow	
			1977	5,924	370	Henrys Lake cutthroat	
			1978	2,890	181	Catchable rainbow	
			1979	6,459	404	Catchable rainbow	
			1979	4,484	280	Kamloops rainbow	
			1980	4,970	311	Catchable rainbow	
			1981	5,000	312	Westslope cutthroat	
			1982	5,032	314	Westslope cutthroat	
	Caribou (near Keokee Mtn.) (2-196)	6.8	1977	3,148	463	Henrys Lake cutthroat	
			1978	2,568	378	Henrys Lake cutthroat	
			1983	2,872	422	Henrys Lake cutthroat	
			1984	1,750	257	Westslope cutthroat	
Spokane	Mirror (3-117)	5	1979	5,195	1,039	Henrys Lake cutthroat	Winter kill lake, evaluate before further stocking.
			1981	5,000	1,000	Westslope cutthroat	
	Elsie (3-119)	10	1977	1,505	151	Catchable rainbow	Stock catchable rainbow annually, other fish were show pond (SP) fish from Mullan Hatchery.
			1978	2,020	202	Catchable rainbow	
			1979	1,665	166	Catchable rainbow	
			1979	21	—	Dolly Varden (SP)	
			1980	3,190	319	Catchable rainbow	
			1981	3,875	388	Catchable rainbow	
			1981	49	—	Rainbow (SP)	
			1981	48	—	Cutthroat (SP)	

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Table 2. Continued.

Drainage	Lake	Surface acres	Year stocked	Number stocked	Stocking rate (fish/acre)	Stock of fish	Comments
Spokane	Elsie (continued)	10	1981	53	—	Brook trout (SP)	
			1981	14	—	Kokanee (SP)	
			1981	1	—	Dolly Varden (SP)	
			1982	1,440	144	Catchable rainbow	
			1983	1,500	150	Catchable rainbow	
			1984	2,865	286	Catchable rainbow	
	Lower Glidden (3-123)	12	1977	1,680	140	Catchable rainbow	
			1978	2,486	207	Catchable rainbow	
			1979	4,240	353	Catchable rainbow	
			1980	2,030	169	Catchable rainbow	
			1981	1,950	162	Catchable rainbow	
			1982	1,880	157	Catchable rainbow	
			1983	1,000	83	Catchable rainbow	
			1984	4,945	412	Catchable rainbow	
	Upper Glidden (3-124)	10	1978	2,000	200	Kamloops rainbow	Evaluate Kamloops control of stunted brook trout.
			1980	992	99	Kamloops rainbow	
	Gold (3-125)	3	1978	500	167	Kamloops rainbow	
			1979	384	128	Brook trout	
			1981	1,000	333	Westslope cutthroat	
			1983	1,005	335	Henrys Lake cutthroat	
	Revett (3-130)	12	1980	992	83	Kamloops rainbow	Evaluate Kamloops control of stunted brook trout.
	Crater (3-133)	5	1979	5,000	1,000	Grayling	Reserve for grayling.
			1983	5,000	1,000	Grayling	
	Dismal (3-138)	?	1979	2,670	—	Catchable rainbow	
			1980	870	—	Catchable rainbow	
			1983	1,500	—	Catchable rainbow	
			1984	537	—	Catchable rainbow	

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Table 2. Continued.

Drainage	Lake	Surface acres	Year stocked	Number stocked	Stocking rate (fish/acre)	Stock of fish	Comments
Spokane	Bacon (3-144)	9	1979	4,156	462	Henrys Lake cutthroat	
			1981	4,000	444	Westslope cutthroat	
	Forage (3-146)	13	1977	4,000	308	Golden trout	Reserve for goldens.
			1979	3,330	256	Golden trout	
	Halo (3-147)	12	1979	5,195	433	Henrys Lake cutthroat	
			1981	5,000	417	Westslope cutthroat	
	Crystal (3-160)	10	1978	4,830	483	Henrys Lake cutthroat	
			1979	4,848	485	Henrys Lake cutthroat	
			1981	9,988	999	Westslope cutthroat	
			1983	4,380	438	Henrys Lake cutthroat	
Little North Fork Clearwater	Devils Club (6-113)	4	1981	3,014	753	Westslope cutthroat	
	Larkins (6-117)	12	1979	3,117	260	Henrys Lake cutthroat	
			1981	3,014	251	Westslope cutthroat	
	Mud (6-118)	6	1979	3,117	520	Henrys Lake cutthroat	
			1981	3,014	502	Westslope cutthroat	
	Hero (6-119)	4	1979	3,117	779	Henrys Lake cutthroat	
			1981	3,014	753	Westslope cutthroat	
	Heart (6-122)	40	1979	3,117	78	Henrys Lake cutthroat	
			1981	3,014	75	Westslope cutthroat	
	Northbound (6-123)	12	1979	3,117	260	Henrys Lake cutthroat	
			1981	3,014	251	Westslope cutthroat	

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Table 2. Continued.

Drainage	Lake	Surface acres	Year stocked	Number stocked	Stocking rate (fish/acre)	Stock of fish	Comments
Little North Fork Clearwater	Skyland (6-125)	13	1979	3,117	240	Henrys Lake cutthroat	
			1981	3,014	232	Westslope cutthroat	
	Fawn (6-126)	13	1979	3,117	240	Henrys Lake cutthroat	
			1981	3,014	232	Westslope cutthroat	
	Noseeum (6-130)	4	1977	1,500	375	Henrys Lake cutthroat	
			1978	1,900	475	Henrys Lake cutthroat	
			1981	1,174	294	Rainbow/cutthroat hybrids	
	Steamboat (6-131)	9	1979	4,000	444	Grayling	Reserve for grayling.
			1981	1,174	130	Rainbow/cutthroat hybrids	
	Copper (6-201)	3	1978	1,000	333	Henrys Lake cutthroat	
			1981	1,000	333	Westslope cutthroat	
			1981	1,000	333	Rainbow/cutthroat hybrids	
	Gold (6-202)	8	1978	1,500	188	Rainbow	
			1981	1,500	188	Westslope cutthroat	
			1981	888	111	Rainbow	
	Tin (6-204)	3	1978	1,000	333	Henrys Lake cutthroat	
			1981	1,000	333	Westslope cutthroat	
			1981	1,000	333	Rainbow/cutthroat hybrids	
	Silver (6-205)	10	1978	2,000	200	Rainbow	
			1981	2,00	200	Westslope cutthroat	
			1981	888	89	Rainbow	

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JOB PERFORMANCE REPORT

State of: Idaho

Project No.: F-71-R-9

Job No.: I-b

Name : REGIONAL FISHERY MANAGEMENT INVESTIGATIONS

Title: Region 1 Lowland Lakes Investigations

Period Covered: 1 January 1984 to 31 December 1985

ABSTRACT

A routine, officer creel census was established in 1984 to provide information on fishing effort and harvest throughout the Region.

An evaluation of the hatchery catchable rainbow trout program was also initiated using the routine census and tag returns. A relationship of catch rate and stocking rate was described. The data will be used to make stocking recommendations to meet the goals of the drainage management plan.

Bass fishing effort on Thompson Lake in 1984 under the new trophy bass regulations was similar to effort prior to the new regulations. Bass tournaments on Coeur d'Alene Lake and the Pend Oreille River were monitored, and length frequency data was collected and compared to previous data.

Research efforts on Priest Lake focused on population dynamics of wild cutthroat and the contribution of hatchery fish to the population. University of Idaho graduate research focused on production of juvenile cutthroat in the tributaries. The westslope cutthroat brood stock operation at the Clark Fork Hatchery has been modified to maximize fry production to compliment current research efforts. Survival of kokanee fry released in Priest Lake has varied from 4.5 to 27.5% but has apparently been good enough that kokanee are showing up in lake trout stomachs and a viable fishery is probable.

Returns of Gerrard stock rainbow to Spring Creek were evaluated by redd counts. Past and future releases of hatchery-reared progeny obtained from wild adult fish will continue on a limited experimental basis until better data on survival and predatory impact are available. An electrophoretic evaluation of the Pend Oreille Lake rainbow stocks indicated that 75 to 80% of the genetic material is similar to Kootenay Lake stocks while **4%** was from westslope cutthroat and the remainder was from coastal type stocks.

Research on the status of adfluvial trout and char populations in the Pend Oreille system was continued with salary money being provided by the Lake Pend Oreille Idaho Club. The relative abundance and distribution of juvenile fish was assessed by snorkeling. Adult bull trout abundance and spawning distribution was assessed from redd counts.Length measurements and scales collected from angler-caught fish were used to describe growth, life history patterns, mortality and genetic integrity of the rainbow population. Sediment coring was conducted to describe quality of spawning habitat and to provide a basis for monitoring the impact of forest development on fisheries.

A census was conducted on the north end of Coeur d'Alene Lake from May 25 to June 17 and an estimated 13,248 hours were expended to catch 1,007 cutthroat, 14,474 kokanee and 94 chinook. Releases of chinook fingerlings were reduced to 10,500 fish in 1984 in response to a declining kokanee population. Chinook were trapped in Wolf Lodge Creek, and 50,000 eggs were collected to continue the program.

Limnological and fisheries surveys were completed on 10 lowland lakes during 1984. Data on limnology, lake productivity and relative abundance and stock levels for fish and zooplankton have now been gathered on 24 lakes. The data will be used to make stocking recommendations to meet the goals of the drainage management plans.

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RECOMMENDATIONS

1. Opening day creel census information on effort, catch and catch rates should be maintained on Hauser, Jewell, Kelso, Mirror, Spirit and Lower Twin lakes to provide trend information to evaluate fishery management plan objectives.

2. Stocking rates of about 300 catchable trout/ha should be the goal in small lakes (<50ha) to achieve catch rates of approximately 0.5 fish/hr. Stocking rates of 50 fish/ha should provide catch rates of 0.2 fish/hr.

3. The *officer* creel census should be continued to provide basic data on effort and catch rates so modifications to stocking levels can be justified. Creel census data is needed on Cocollala, Upper and Lower Twin, Robinson, Brush, Smith and Kelso lakes. Return to the creel data from tag returns is needed on the Pend Oreille River, Robinson, Upper Twin and Brush lakes.

4. Basic data has been established in the lowland lake surveys. A major portion of regional time should be directed toward refining the survey program, increasing the fish sample size and establishing a stocking model for salmonids based on lake productivity, growth and angler demand. Enhancement opportunities for warmwater fish populations through habitat improvement, species transplants and new species introduction should be identified.

5. An estimate of angler compliance with new, more restrictive, bass regulations should be a priority for enforcement *efforts* as soon as is possible.

6. Length frequency data on tournament-caught bass should be collected to provide trend information on specific populations.

7. Increasing numbers of black bass tournaments in north Idaho could have detrimental *effects* on certain populations of bass. We should work with the bass clubs to:

   A. discourage excessive tournament activity,
   B. discourage focusing on individual lakes,
   C. discourage August tournaments, and
   D. shorten fishing days for tournaments that are held in August.

8. Management, research and hatchery personnel time will need to be allocated toward the collection of westslope cutthroat brood stock in Priest Lake to be placed in Kerr Lake in order to achieve the goal of improved genetic diversity and increased fry production.

9. Annual releases of 1.5 to 2.0 million kokanee in Priest Lake should be the goal until additional data is available. The long-term goal for re-establishment of kokanee will be to provide catch rates of about 0.5 fish/hr. and a limited forage base for lake trout.

10. Weak year classes of kokanee in Spirit Lake should be supplemented with hatchery fry to stabilize the population. Heavy fishing pressure should be maintained to avoid strong year class fluctuation and the negative effects *of* overpopulation.

11. When available, relatively few kokanee (10-15/ha) should be stocked in Brush, Cocolalla, Fernan, Hauser, Jewel, Kelso, Mirror, Smith and Lower Twin lakes and evaluated to determine if they are providing anglers with catches of relatively large fish.

12. Trend information on kokanee populations in Coeur d'Alene, Pend Oreille, Priest and Spirit lakes is necessary for the proper management of these populations and the fishing they provide. Data needed on an annual basis are: (1) age specific mortality and year class strength; (2) estimate *of* total population size; (3) length frequency and age class composition of spawning fish; and (4) relative survival and contribution of hatchery-released fish.

13. Return of hatchery-reared Gerrard rainbow to Spring Creek should be monitored I n 1985 and 1986 to evaluate survival of fingerlings released in 1979 and 1980. All future releases of juvenile fish should be fin clipped and limited to 10,000 fish or less to further evaluate returns. Only large, late maturing Gerrard stock fish should be used. Our current policy of no introductions of other rainbow stocks into the basin should be maintained.

14. Creel census data on Lake Pend Oreille tributaries is a priority data collection need to evaluate the significance of tributary fishing (relative exploitation) and model potential regulation changes for the lake.

15. The spawning run of fall chinook into Wolf Lodge Creek in mid-September should be restricted to the lower portion of the creek (at or below the Wolf Lodge Campground) by a block weir to prevent competition of juvenile chinook with juvenile cutthroat fingerlings. All chinook fingerlings released in the future should be marked with an adipose fin clip to determine if wild fish are contributing to the population.

OBJECTIVES

Obtain key biological, physical and chemical data on selected lowland lakes in Region 1 to provide baseline information for species and stock management programs.

Assess performance and contribution of existing trout stocks.

TECHNIQUES AND FINDINGS

Routine Census

During 1983 and 1984, we initiated a routine data collection system to describe fishing effort and success on Region 1 waters. Most of the data was collected by conservation officers, but other personnel participated. The intent is to provide consistent long-term data on waters other than the major fisheries that have been evaluated in the research program. Data will be used to evaluate success of management programs and detect areas in need of greater attention. Data were collected on four lakes during 1984 and one lake in 1983 (Table 1). Fishing effort was estimated at over 40,000 hours on Hayden, Hauser and Fernan lakes making them among the most heavily used fisheries in the Region. Although total hours on Round Lake was only 13,100, fishing pressure (hrs/ha) was quite high because of the relatively small size of the lake.

Census data has been maintained specifically for opening day for several years on Hauser, Jewell, Kelso, Mirror, Spirit and Lower Twin lakes (Table 2). Although catch rates have been variable, opening day fishing has typically been good. Catch rates for brook trout declined from past years in Mirror Lake, however. The drop is related to reduced stocking.

Catchable Program Evaluation

The Region 1 lakes have been shifted to standardized stocking rates (number/area) for catchable-size rainbow trout to facilitate evaluation of the program. The small lakes are stocked at 250 to 400 fish/ha and the very large lakes at 3 to 6 fish/ha. Intermediate lakes are stocked at densities of 10 to 60 fish/ha. Stocking rate is realistically a function of lake size but can be adjusted where demand and rates of return makes that appropriate.

In 1984, we used conservation officer census data, historic census data and tag return data to evaluate the catchable program. Catchable returns from tagging data were corrected for the noncompliance bias by using reward tags as described in Rieman (1983). The estimated rates

Table 1. Routine census data collected on takes in Region 1, Idaho, during 1983 and 1984.

Lake	Period	(N)	$\bar{X}$ anglers counted	Est. hours	Hours/acre	Catch rate Fish/hour HRB	Total Salmo	Spiny ray
Fernan	Jan-Mar	198	17	—	—	.14	.14	1.60
	Apr-Sep	592	28	63,000	160	.13	.13	.23
Hauser	Apr-Sep	375	22	49,500	89	.26	.26	.16
Hayden	Apr-Sep	300	18	40,500	11	—	.03	.96
Round[1]	Apr-Sep	—	—	13,100	252	.83	.83	.40
Coeur d'Alene		1,794	—	—	—	—	.92[1]	—
Wolf Lodge		1,040	—	—	—	—	.92[1]	—

[1]Primarily kokanee.

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Table 2. Opening day catch rates for salmonids on select LowLand Lakes in Region 1, Idaho, 1982-1984.

Lake	Year	Anglers interviewed	Hours fished	Catch rate (Fish/hour) RB	CT	BK	BN	KOK	Combined catch rate
Hauser	1982	128	295	.18	.—	.01	.—	.—	.19
	1983	86	126	.64	.—	.01	.—	.—	.65
	1984	95	194	.46	.—	.—	.—	.—	.47
Jewel	1982	28	98	.—	.17	.—	.—	.04	.21
	1983	28	26	.—	.19	.—	.—	.—	.19
	1984	11	9	.—	.44	.—	.—	.—	.44
Kelso	1982	43	134	.44	.—	.—	.01	.—	.45
	1983	73	163	.85	.—	.—	.—	.—	.85
	1984	85	126	1.19	.—	.—	.—	.—	1.19
Mirror	1982	133	458	.—	.03	1.31	.04	.—	1.38
	1983	143	498	.—	.—	1.30	.03	.02	1.35
	1984	138	353	.—	.16	.24	.01	.—	.42
Spirit	1982	124	348	.05	.01	.—	.—	.28	.34
	1983	121	258	.12	.—	.01	.—	.69	.82
	1984	—	—	.—	.—	.—	.—	.—	.—
Lower Twin	1983	99	365	.19	.01	.01	.—	.—	.21
	1984	40	40	.52	.—	.—	.—	.—	.52
Round Lake	1984	10	35	.37	.37	.—	.—	.—	.37

of return ranged from 6% to over 50% in the study lakes (Table 3). Catch rates on four lakes ranged from 0.07 to 0.83 fish/hour. It appears that catch rates is a direct function of stocking density (Fig. 1) and that return to the creel may be dependent on fishing pressure (Fig. 2).

In small lakes (<50ha), stocking rates to maintain catch rates in excess of 0. 5 fish per hour can be achieved with relatively low numbers of fish. Unless a lake is specifically targeted for special management or receives unusually heavy pressure, stocking rates of approximately 300 fish/ha should be the target.

In larger lakes (>50ha), catch rates of 0.2 fish per hour may be the appropriate goal for current numbers of catchables. Because of the large numbers of fish required to significantly improve catch rates in larger systems, stocking rates of approximately 50 fish/ha should be the goal. In very large systems or those where catchables represent a supplementary fishery stocking rates could be reduced. Where fishing pressure or return to the creel warrant special programs, stocking rates could be increased. In systems where fishing pressure and return to the creel are consistently very low, efforts should be made to direct more pressure to the lakes or stocking should be curtailed entirely.

In the future, stocking requests will be modified to be consistent with these goals. Additional data on return to the creel and fishing pressures are necessary for all lakes. Particular emphasis for new creel data will be placed on Cocollala, Upper and Lower Twin, Robinson, Brush, Smith and Kelso lakes. Return to the creel data will be emphasized with tagging on the Pend Oreille River, Robinson, Upper and Lower Twin and Brush lakes.

Largemouth Bass

Thompson Lake Census

During 1984, we conducted an angler count census on Thompson Lake with assistance from the Wildlife Management Area staff. The census was conducted to provide a comparison of fishing effort in 1981-1982 with that following implementation of special bass regulations. Estimated effort was 4,800 angler hours, virtually the same as that in 1981 (4,800) and 1982 (4, 900).

The temporal distribution of fishing effort was also similar to earlier data though a peak in effort did occur during July following opening of the harvest season (Fig. 3). Our concern was that fishing effort would focus on Thompson Lake following the opening to harvest on July 1. If that produced a major Increase in mid- and late-season effort, the new regulation might not achieve the goal of reduced exploitation. The regulation change did not appear to significantly alter fishing

Table 3. CatchabLe rainbow trout stocking rates, catch rates and rate of return for Lakes in Region 1, Idaho.

Lake	Area		Current stocking rates		Estimated percent return	Catch rates fish/hour	Fishing pressure hours/acre	Total hours
	Acre	HA	#/acre	#/HA				
Fernan	392	158	60	148	50%	0.14	160	56,000
Hauser	554	224	20	49	35%	0.26	90	5,000
Spirit	1,620	656	6	15	50%	0.07	43	70,000
Pend Oreille River	2,956	1,196	3	8	6%	—	—	—
Cocollalla	770	312	20	49	6%	—	—	—
Lower Twin	300	121	20	49	—	—	—	—
Upper Twin	500	202	10	25	—	—	—	—
Bonner	23	9	130	321	—	—	—	—
Brush	29	12	150	371	—	—	—	—
Robinson	50	20	160	395	—	—	—	—
Smith	38	15	160	395	—	—	—	—
Kelso	61	25	160	395	—	—	—	—
Round	52	21	100	247	80%[1]	0.83	252	13,000
Elsie	20	8	150	375	—	—	—	—
Glidden	25	10	120	300	—	—	—	—
Porcupine	13	5	70	200	—	—	—	—
Dismal	10	4	50	125	—	—	—	—
Stone Ridge	30	12	70	160	—	—	—	—

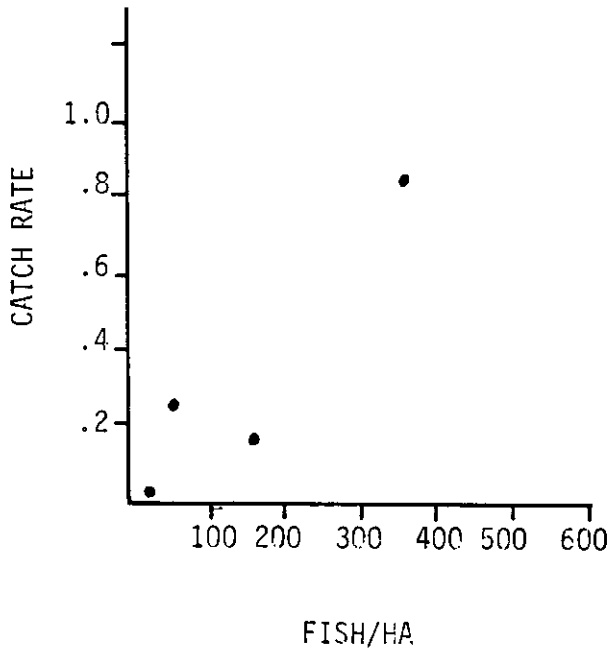


Figure 1. Relationship of catchable rainbow trout stocking density and catch rate for lakes in Region 1, Idaho.

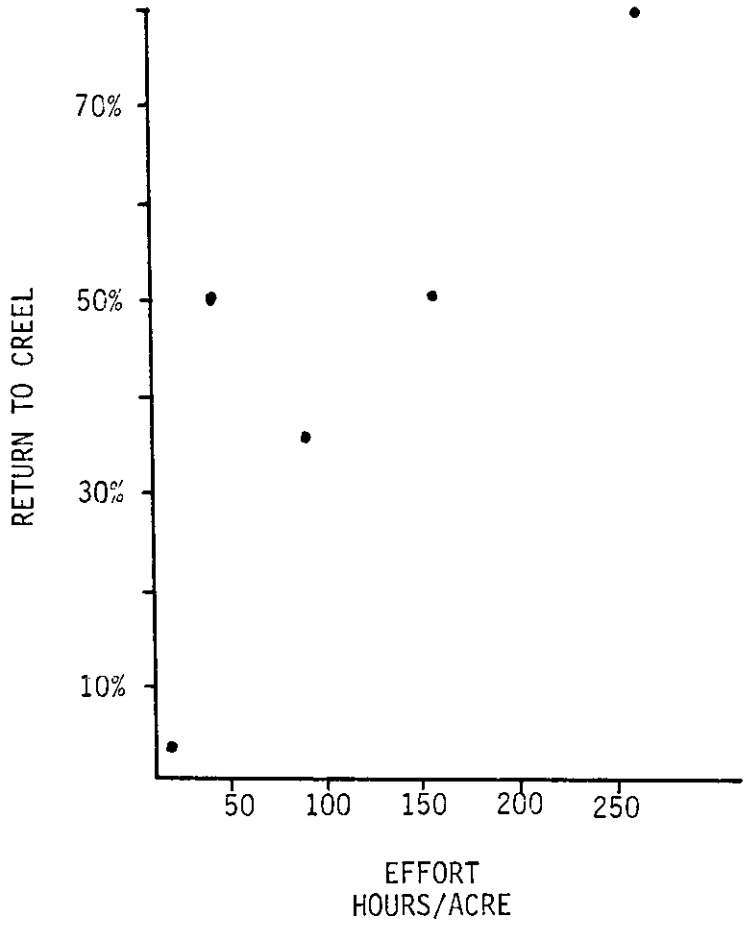


Figure 2. Relationship of fishing effort and return to the creel for catchable trout stocked in lakes in Region 1, Idaho.

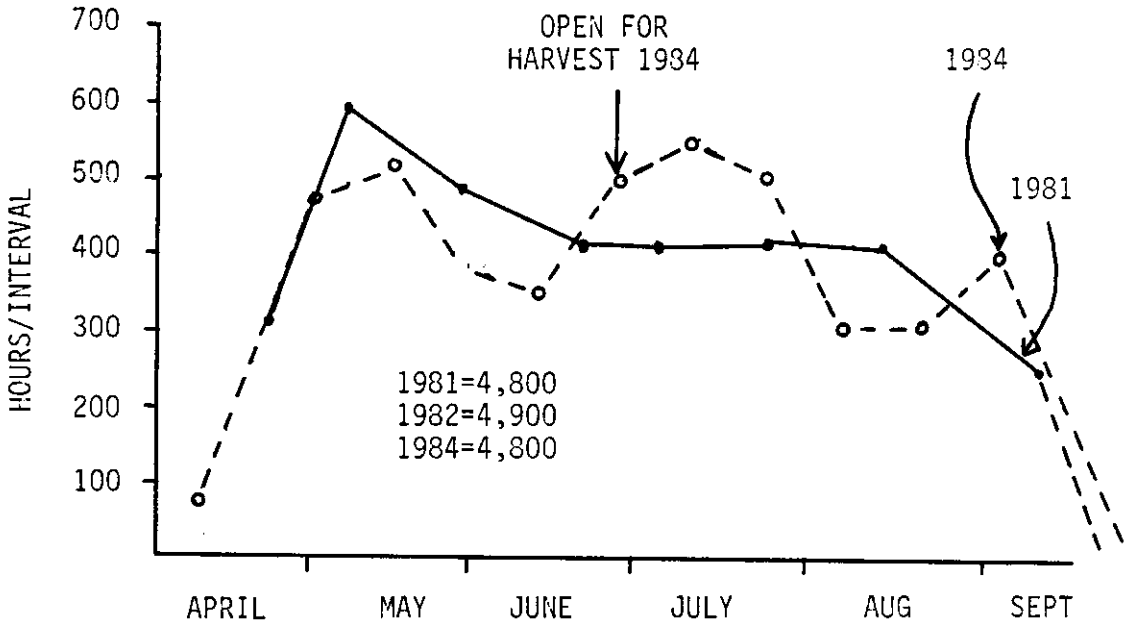


Figure 3. Temporal distribution of fishing effort on Thompson Lake, Kootenai County, Idaho, in 1981 and 1984.

pressure on Thompson Lake in 1984 relative to earlier years. Assuming good compliance with the no-kill season and 14" minimum size limit during the harvest season, the regulations should reduce exploitation. No estimate of angler compliance has been made with the new bass regulations. That should be a priority of enforcement efforts as soon as possible.

Tournaments

We monitored two bass tournaments during 1984. One was held on the Pend Oreille River out of Sandpoint on June 23 and 24 and the second on the Coeur d'Alene system out of Harrison on August 4 and 5. Although limited data can be collected at a bass tournament, it may be useful for long-term evaluation of populations if no other data is available (Willis and Gabelhouse 1983). This is the first data we have collected from the Pend Oreille River and a continuation of data collected on the Coeur d'Alene system. A total of 63 fish were caught and released in the Pend Oreille tournament with no obvious mortality. Average length was approximately 390 mm (Fig. 4), and tournament catch rate was 0.12 fish/hour. A total of 188 bass were caught and released at Harrison. Initial mortality was 8% on the first fishing day and 4% on the second day. Initial mortality was similar to that seen in past August tournaments with approximately twice the loss on the longest fishing day.

Because of the 12" minimum size limit, a PSD could not be calculated for the catch composition rates. The Harrison tournament also imposed a 14" minimum on all weigh-in fish. To examine relative structure of the samples, we therefore calculated an arbitrary relative stock density index for fish greater than 14" or approximately 350 mm and 400 mm (RSD 400/350). It should be possible to use this type of index as a measure of stock structures and relative abundance of larger fish on a long-term basis. A decline in RSD over time could be indicative of increasing mortality and over-fishing. The RSD calculated for the Pend Oreille River data was .64. The Coeur d'Alene RSD was .35, similar to earlier years (Table 4). The data suggest that the structure of the Pend Oreille River population is better (more large fish than the Coeur d'Alene system). Data from other Coeur d'Alene populations considered to be in relatively good condition ranged from .43 to .48. An RSD calculated for Fernan Lake, which was considered to be seriously over-exploited (Rieman 1983) was .63. Obviously, the index may not be as sensitive to population problems as desired. Care should be used in comparison between lakes and with small sample sizes. The data may be best used as trend information for a single population. In that light, it is desirable to collect tournament data on the Coeur d'Alene system as frequently as possible.

Table 4. Relative stock density (RSD 400/350) for largemouth bass caught in the Coeur d'Alene Lake system and weighed in at Harrison, Idaho, during the North Idaho Bass Club August Tournament.

Year	Bass weighed in	$\bar{X}$ length	RSD $\frac{400}{350}$
1981	248	--	.31
1982	307	--	.43
1983	299	--	.44
1984	188[1]	390 mm	.35

[1] First year 14" minimum size limit imposed.

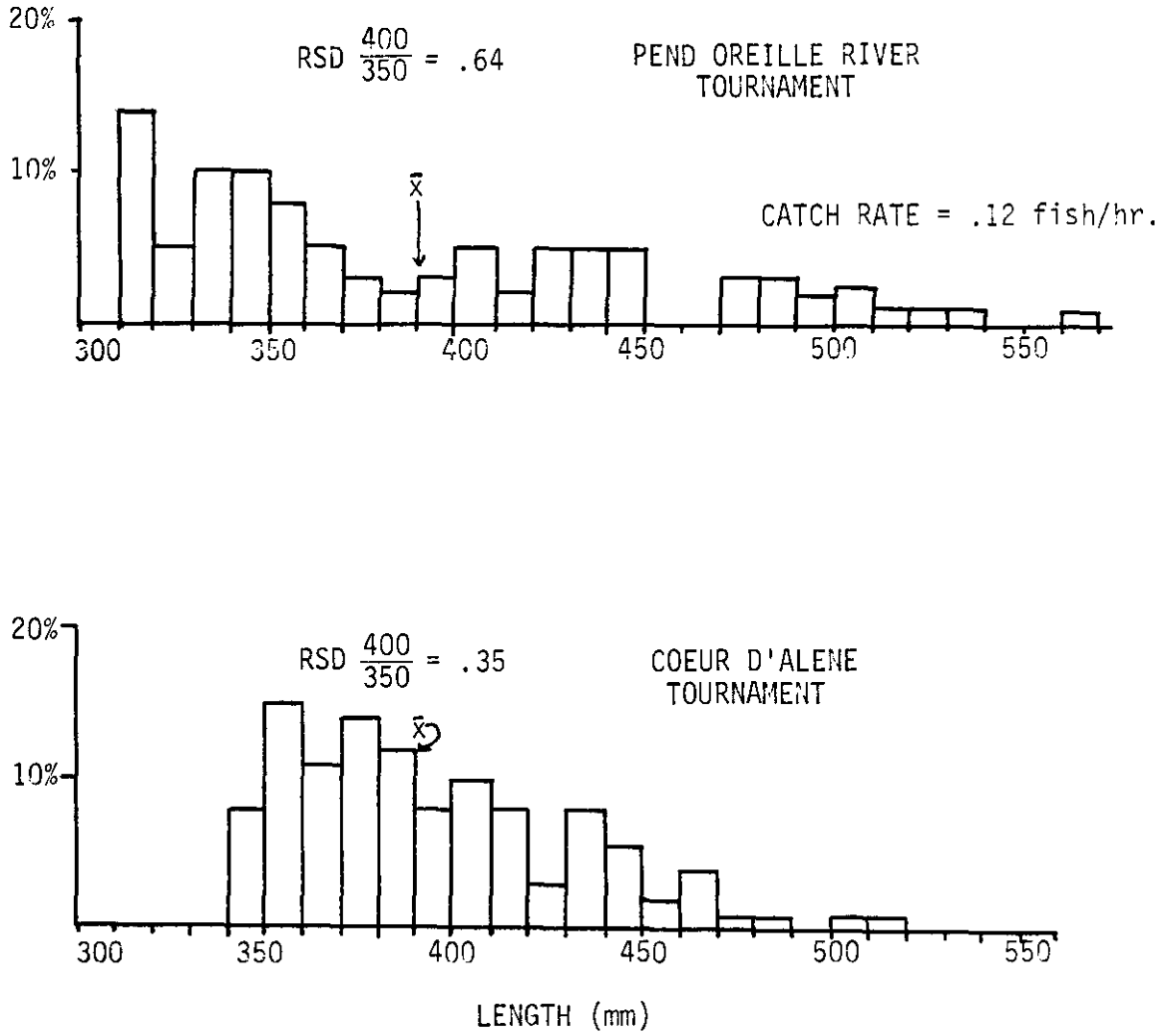


Figure 4. Length frequencies of largemouth bass weighed in at tournaments on Coeur d'Alene Lake and the Pend Oreille River, Idaho, in 1984.

A number of bass tournaments are scheduled for this Coeur d'Alene system during 1985. Several (5?) major tournaments are scheduled during August. This type of tournament fishing effort could result in a significant increase in exploitation on individual lakes (Rieman 1983). Tournament fishing could be a particular problem on lakes under special regulation since anglers may concentrate in the areas anticipating better fishing or larger fish. The impacts of tournament fishing may also be accentuated during August since post-hooking mortality may be greatest during that period (Rieman 1983). Working with the bass clubs, every effort should be made to (1) discourage excessive tournament activity; (2) discourage focusing on individual lakes; (3) discourage August tournaments; and (4) shorten fishing days for tournaments that are heid in August.

Priest Lake

Cutthroat

The research program initiated on Priest Lake in 1983 was maintained during 1984. Department work focused on population dynamics and contribution of hatchery fish (Mauser et al., in preparation). Much of the effort went toward development of purse seine methodology.

Total annual mortality estimates appear to be high (60-70%) but may be biased by increasing recruitment. In 1983, contribution of hatchery fingerlings was good. The proportion of hatchery fish in later year classes appeared to decline, however, and the value of fingerling releases may be questionable. The first returns of experimental fingerling releases in Tango Creek should show up in 1985. A better estimate of overall survival and contribution of hatchery fingerling should be available in that and future runs.

The University of Idaho research program concentrated on tributary production of juvenile cutthroat (Irving, in preparation). Data from that work show that current tributary populations range from moderate to low and increased production should be possible. Experimental fry releases appeared to be a promising method for re-establishing production, though invading brook trout populations may ultimately limit that potential. Optimum stocking densities for fry were approximately 500 fish/100m^2.

In the future, research on Priest Lake will address hatchery fingerling contribution as a function of size and time of release, solely through experimental releases in Tango Creek. Most of the hatchery production will shift from fingerling to fry to provide large scale evaluation of fry releases. The University of Idaho will initiate a new research project in 1985 to evaluate the large fry releases. Eradication of brook trout in a single stream followed by reintroduction of cutthroat should also be considered as part of the new research program.

Goals of the westslope cutthroat program for Priest Lake will be to produce 50,000 2-year-old fingerlings for Tango Creek and to maximize production of swim-up fry. With the reduced fingerling production (350,000 to 50,000), it should be possible to double the brood stock for increased fry production. Genetic integrity of the brood stock should be maintained by annual infusion of fish from wild parents. We will continue to use Kerr Lake to hold feral brood stock for this purpose. In 1984, we collected 50 cutthroat from Priest Lake by purse seine for Kerr Lake. The fish ranged from 20 to 40 cm, but most were large enough to be mature and should contribute to an egg collection in 1985.

Kokanee

A total of 500,000 kokanee were released in Priest Lake during 1984. Estimated survival to fall fry was 8 to 10% compared to earlier estimates ranging from 4.5% to 27.5% (Mauser et al., in preparation). Although survival has been highly variable, it does appear to be good enough to support a viable program. Kokanee have begun showing up in stomachs of lake trout and could contribute to a fishery in 1985. Goals for release should be approximately 1.5 to 2.0 million fish annually until long-term success of the program can be evaluated. Long-term goal for re-establishment of kokanee will be to provide a fishery of approximately 0.5 fish/hour and a limited forage base for lake trout.

Pend Oreille Lake

Gerrard Rainbow

In 1984, we made an effort to monitor the run of rainbow in Spring Creek. The work was initiated to determine whether previous releases of hatchery-reared juvenile (from wild parents) had resulted in any significant returns. Major releases made in 1978, 1979 and 1980 could have produced a larger than normal run in 1983 and 1984 and may produce large runs in 1985 and 1986 (Table 5). In 1984, we surveyed Spring Creek periodically from mid-April through mid-May. We observed a maximum of four fish in the creek and eight fish at the confluence of Spring Creek and Lightning Creek. On May 3, we counted 18 redds in Spring Creek. Historic counts have ranged from 2 to 60 fish (Pratt 1985). It does not appear that any increase in adult return has occurred as a result of releases to date. It is possible that past releases contributed significantly to the population, but adults have strayed from the release site. Releases of 5,000 to 15,000 hatchery-reared Gerrard rainbow have contributed up to 20% of the catch on Kootenay Lake while no fish have returned to the release site. At the same time, significant numbers of hatchery fish have been observed spawning in the wild (Harvey Andrusak, B.C. Ministry of Environment,

Table 5. Releases of Gerrard rainbow trout in tributaries of Pend Oreille Lake, Idaho. 1976-1984.

Year released	Age	Year class	Origin[1]	Number	Release site	Possible[3] years of return
1976	0	1976	H	519,000	Spring Creek	--
	0	1976	W	62,000	Spring Creek	--
	3	1973	W	1,333	Spring Creek	--
1977	0	1977	W	2,590	Spring Creek	82-83
1978	5	1973	W	160	Spring Creek	-
1979	0	1979	W1	41,019	Spring Creek	84-85
	1	1978	W1	17,464	Spring Creek	83-84
	2	1977	W	876	Spring Creek	--
	3	1976	W	580	Spring Creek	--
1980	1	1979	W1	33,330	Spring Creek	84-85
1982	1	1981	W	10,740	Spring Creek	85-87
1983	1	1982	W	148,405[2]	Cabinet Gorge	87-88
1984	1	1983	W	9,328[4]	Granite Creek	88-89
	1	1983	W	10,736[4]	Spring Creek	88-89

[1]H = Hatchery brood stock, W = wild parents, W1 = first generation from wild parents.
[2]10,600 adipose clipped.
[3]Assumes first maturity at 5 or 6 years.
[4]Adipose clipped.

personal communication). Marked releases may be necessary to adequately evaluate contribution of hatchery fish. For that purpose, approximately 10,000 fish in the 1983 release and all fish in the 1984 release were marked with an adipose clip. All future releases should be marked.

Based on results in Kootenay Lake, releases on the order of 10,000 fish may result in a significant increase in population size. Unwanted impacts In genetics integrity (due to a small parental group) and predation on kokanee could result from large releases. All releases should be made on a limited experimental basis until better data on survival and predatory impact are available.

Electrophoretic evaluation of the Pend Oreille rainbow stocks was conducted in 1984. The work was done to determine whether historical introductions of domestic rainbow in the drainage had reduced genetic integrity in the original Gerrard stock. Results of the work conducted at the University of Montana indicate that 75% to 80% of the rainbow genetic material is from Kootenay Lake stocks, 4% is from cutthroat and the remainder from coastal (domestic) rainbow (Pratt 1985). The data show that integration has occurred. If possible, we will conduct further evaluation of Individual tributaries to see if an isolated pure stock exists in the basin. Any enhancement work should be isolated as much as possible to that stock to maintain the desired Gerrard characteristics. Our current policy of no introduction of other rainbow to the basin should be maintained.

Pend Oreille Trout Research

The project to evaluate the status of adfluvial trout and char populations in the Pend Oreille system was continued in 1984. The project was conducted as a cooperative effort with salary money provided by the Lake Pend Oreille Idaho Club. The relative abundance and distribution of Juvenile fish in tributaries was described through snorkeling. Redd surveys were used to describe the distribution and numbers of bull trout in the spawning escapement. Sediment coring was conducted in a cooperative effort with the U.S. Forest Service to describe quality of spawning habitat in selected streams and to provide a basis for monitoring the impact of forest development on fisheries. An angler participation program was used to collect lengths and scales from the catch and to provide samples for electrophoretic analysis. The data were used to describe growth and life history patterns, mortality and genetic integrity of the rainbow stock.

Juvenile trout and char were distributed throughout the Pend Oreille basin (Pratt 1985). Cutthroat were widely distributed, but also typically occurred at low densities. Rainbow were found at densities up to 120/100m^2 in localized areas and were most abundant in the mid reaches of the Pack River, Grouse Creek and Lightning Creek drainages. Rainbow spawning distribution was inferred from fry distribution.

Bull trout were most localized in their distribution and only used 23% of available stream habitat. Bull trout spawning escapement was estimated at 3,436 fish in 1984. The escapement estimate was similar to that observed in 1983, but distribution of spawning varied considerably. No bull trout redds were observed in the Cabinet Gorge spawning channel where escapements of up to 100 fish have been estimated in the past.

Estimated growth of rainbow trout was similar to that observed in earlier years and to that reported for Kootenay Lake. Age at first spawning was related to age of juvenile migration from the tributaries (Fig. 5). Age at maturity also appears to be declining from that observed in earlier years and is less than that described for Kootenay Lake stocks (Table 6). Electrophoretic analysis indicates that the genetic material in the Pend Oreille rainbow population is predominantly (70-80%) of Gerrard-stock origin, but integration has occurred from domestic rainbow (16-20%) and westslope cutthroat (4%). Estimated mortality of rainbow trout for two years of pooled data ranged from 34% to 47%. Significant differences were evident in the two years of data. Additional work should be done to refine the mortality estimates.

The data we have available indicate that age of maturity may be declining in the Pend Oreille rainbow stock. Such a change may explain an apparent decline in the numbers of very large fish (15-30 lbs.), concerning local anglers. The decline in maturity could be a function of integration by other stocks, exploitation on the lake and perhaps tributary exploitation. The strong relationship between age at maturity and age of migration suggests that tributary fishing could cause selection for earlier maturing (and small) adults. Earlier studies show that tributary fishing definitely selects for 2- and 3-year-old fish (Pratt 1985). Further work should evaluate the significance of tributary fishing (relative exploitation) and model potential regulation changes for the lake. Public involvement should be initiated to evaluate the importance of tributary fishing and potential trade-offs for management of the lake fishery.

Data also indicates a major decline in the Clark Fork River bull trout spawning escapement. A large number of bull trout are harvested off the mouth of the Clark Fork River each spring at the opening of the lake season. That fishery could be targeting adult fish moving into the Clark Fork and may be a factor in the decline. A census estimate of the harvest at the mouth should be conducted to evaluate the significance of the fishery to spawning escapement in the Clark Fork and its tributaries.

Fine sediment appears to be a significant problem in several key bull trout spawning areas. Embryo survival may decline rapidly at sediment levels exceeding 30%. Average fines in bull trout spawning areas in Twin and Gold creeks averaged 34% to 37% (Pratt 1985). Every effort should be made to influence land use decisions in key bull trout drainages to reduce sediment loading.

Table 6. Comparison of age at first spawning of rainbow trout aged from scales collected at Pend Oreille Lake, Idaho, 1972-1976 and 1983-1984, and from Kootenay Lake, British Columbia, 1942-1957.

Time period	N	Age at first spawning 3	4	5	6	7
PEND OREILLE						
1972-1976	Number 132	--	2	24	80	26
(Anderson 1978)	Proportion	--	1%	18%	61%	20%
	Sam. 6-7				-----81%------	
	Sam. 5-7			----------99%--------		
1983-1984	Number 59	3	11	13	22	10
(Pratt 1985)	Proportion	5%	19%	22%	37%	17%
	Sam. 6-7				-----54%------	
	Sam. 5-7			----------76%--------		
KOOTENAY LAKE						
1942-1957	Number	--	--	--	--	--
(Cartwright 1961)	Proportion	--	4%	----92%---		4%
	Sam. 6-7	--	--	--	--	--
	Sam. 5-7	--	--	----------96%--------		

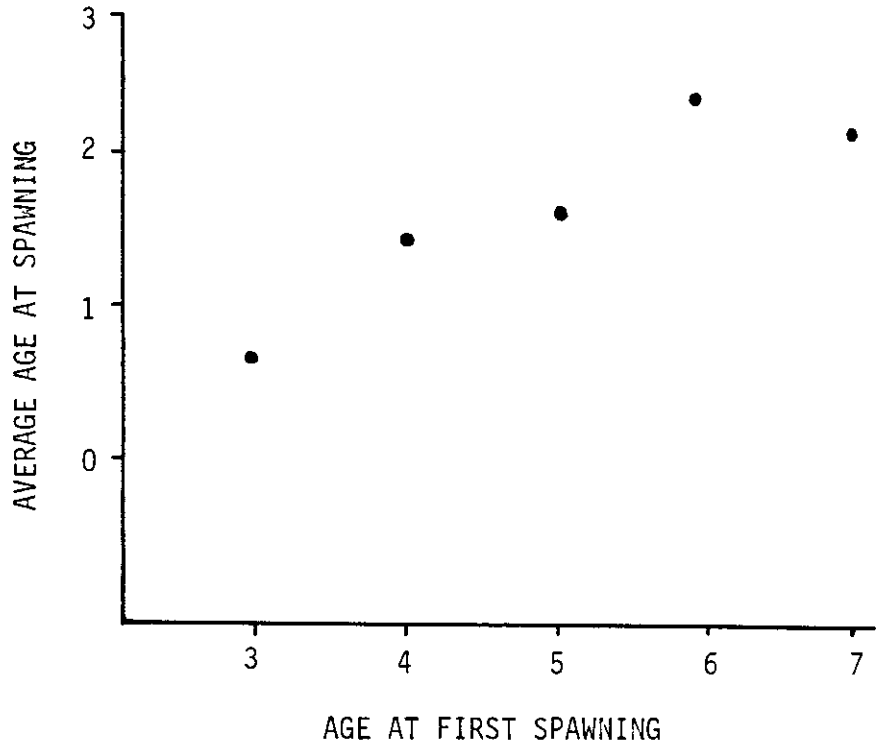


Figure 5. Relationship of mean age of tributary migration and age at first spawning for rainbow trout in the Pend Oreille Lake drainage, Idaho.

Coeur **d'Alene** Lake

Spring Creel Census

In recent years, anglers appeared to be shifting their emphasis from kokanee to cutthroat trout, and the introduction of chinook salmon into Coeur d'Alene Lake has attracted a great deal of interest. We conducted a three-week creel census on the north end of Coeur d'Alene Lake during the spring of 1984 to better quantify fishing effort and harvest for these three fisheries.

Of the 811 anglers interviewed, 804 were fishing for salmonids (Table 7). Bank anglers were mainly fishing for kokanee while boat anglers were mainly fishing for chinook. Kokanee anglers comprised nearly 60% of all the anglers interviewed while almost 25% were fishing for cutthroat, and just over 15% were fishing for chinook.

All anglers combined fished an estimated 13,248 hours to catch 1,007 cutthroat, **14,474** kokanee and 94 chinook (Table 8). Catch rates exceeded 1 fish/hr. for kokanee but were only about .1 fish/hr. for cutthroat and less than .01 fish/hr. for chinook (Table 8).

The length of cutthroat in the catch ranged from 15 to 36 cm; the majority was age 4+ and 5+ fish from 24 to 34 cm (Fig. 6). Kokanee ranged in length from 13 to 27 cm, the mean being 18 and 19 cm (Fig. 7). Chinook data will be presented in a separate section.

Fall Chinook Salmon

Releases of fall chinook salmon were reduced to 10,500 fish in 1984 (Table 9) in response to a decreasing kokanee population. The total estimated kokanee population in Coeur d'Alene Lake has declined from 9.20 million in 1982, to 6.48 million in 1983 and 4.56 million in 1984 (Larry LaBolle, IDFG, personal communication). We attribute this decline to predation by chinook.

Chinook smolts released in 1984 were from Lake Michigan stocks. According to Michigan biologists, about 35 to 40% mature at age 3, 55-60% at age 4 and a few (5% or less) mature at age 5 (Jack Hammond, Michigan Department of Natural Resources, personal communication). This contrasts with the Bonneville stock fish that were released in 1982 and 1983, where about 80% mature at age 3 and 20% mature at age 4 (Harold Hansan, Washington Department of Fisheries, personal communication).

Chinook were harvested in Coeur d'Alene Lake from March through September during 1984. The majority of fish were reportedly caught in the north end of the lake from Tubbs Hill east to Wolf Lodge Bay or in the south central part of the lake from Harrison north to Powderhorn

Table 7. The total number and percentage of anglers interviewed and the hours they fished for cutthroat trout. kokanee and chinook salmon from the bank and in boats on the north end of Coeur d'Alene Lake. Idaho, May 25 to June 17, 1984.

Angling type	Cutthroat		Kokanee		Chinook	
	Anglers	Hours	Anglers	Hours	Anglers	Hours
BANK						
No.	126	259	417	764	0	0
%	23.2	25.3	76.8	74.7	0	0
BOAT						
No.	63	173	61	145	137	479
%	24.1	21.7	23.4	18.2	52.5	60.1
TOTAL						
No.	189	432	478	908	137	479
%	23.5	23.7	59.4	50.4	17.1	26.3

Table 8. Estimated effort on the northern end of Coeur d'Alene Lake, Idaho, May 25 to June 17, 1984, and estimated harvest of cutthroat trout, chinook and kokanee salmon.

Anglers interviewed		Average angler count	Estimated angler hours	Fish/angler hour		Estimated hours
811	Weekend	58.1	8,628	cutthroat	.076	1,007
	Weekend	20.0	4,620	chinook	.0071	94
	TOTAL		13,248	kokanee	1.09	14,474

Table 9. The number, pounds and length of fall chinook salmon released into Coeur d'Alene Lake, Idaho, during 1882-1984.

Release date	Release location	Number released	Pounds released	Length (mm) Mean	Length (mm) Range	Rearing hatchery	Stock of fish
7/19/82	Mineral ridge boat ramp	28,700	1,688	137	125-150	Hagerman	Bonneville
10/5/82	I-90 boat ramp	5,700	600	150	130-170	Hagerman	Bonneville
TOTAL 1982		34,400	2,288				
8/9/83	I-90 boat ramp	30,100	636	109	80-130	Mackay	Bonneville
10/26/83	I-90 boat ramp	30,000	1,402	124	80-150	Mackay	Bonneville
TOTAL 1983		60,100	2,038				
10/19/84	I-90 boat ramp	10,500	820	150	80-190	Mackay and Mullan	Lake Michigan

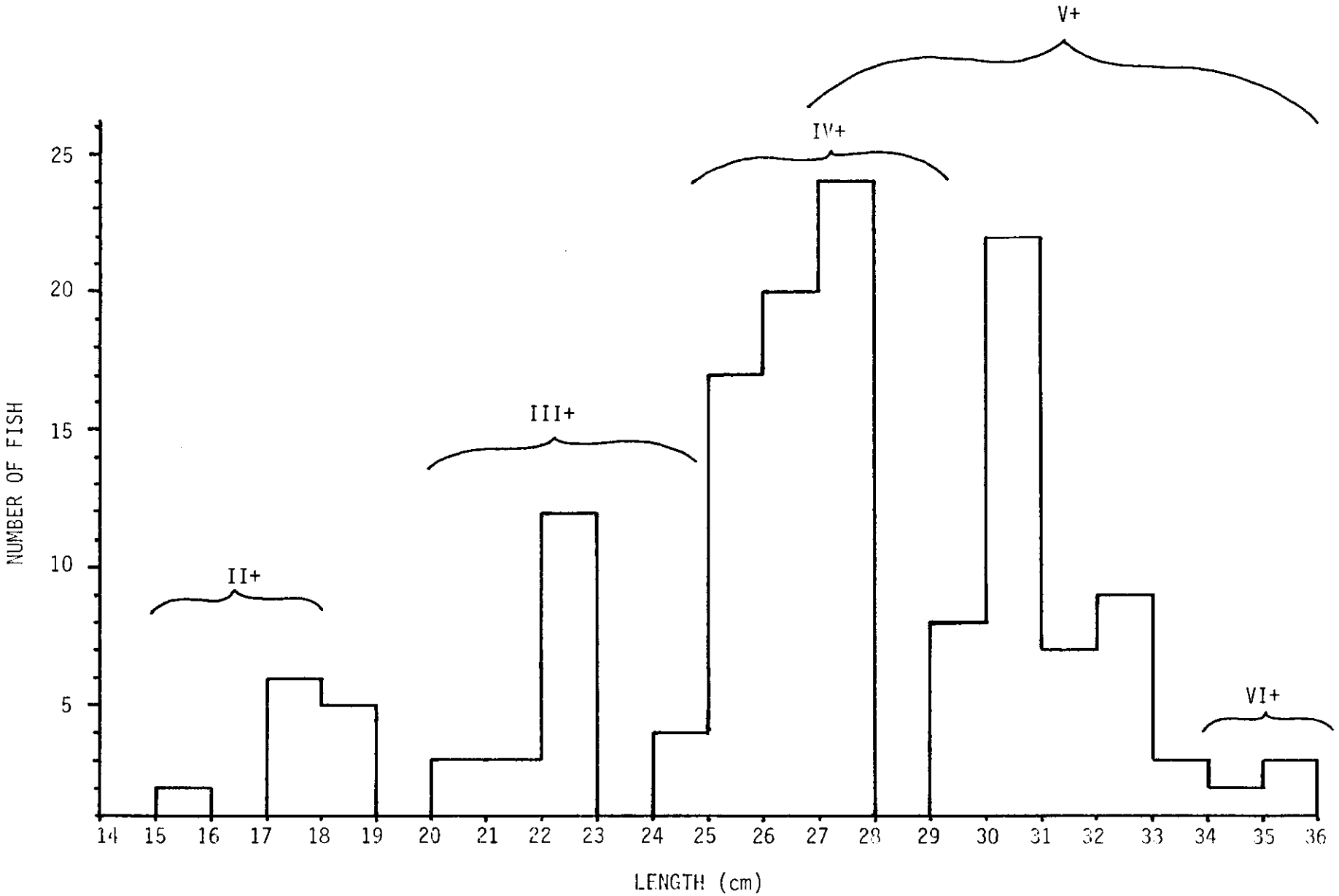


Figure 6. Length frequency of angler-caught westslope cutthroat trout in the north end of Coeur d'Alene Lake, Idaho, May 25 to June 17, 1984. Length at age data from Lukens (1978).

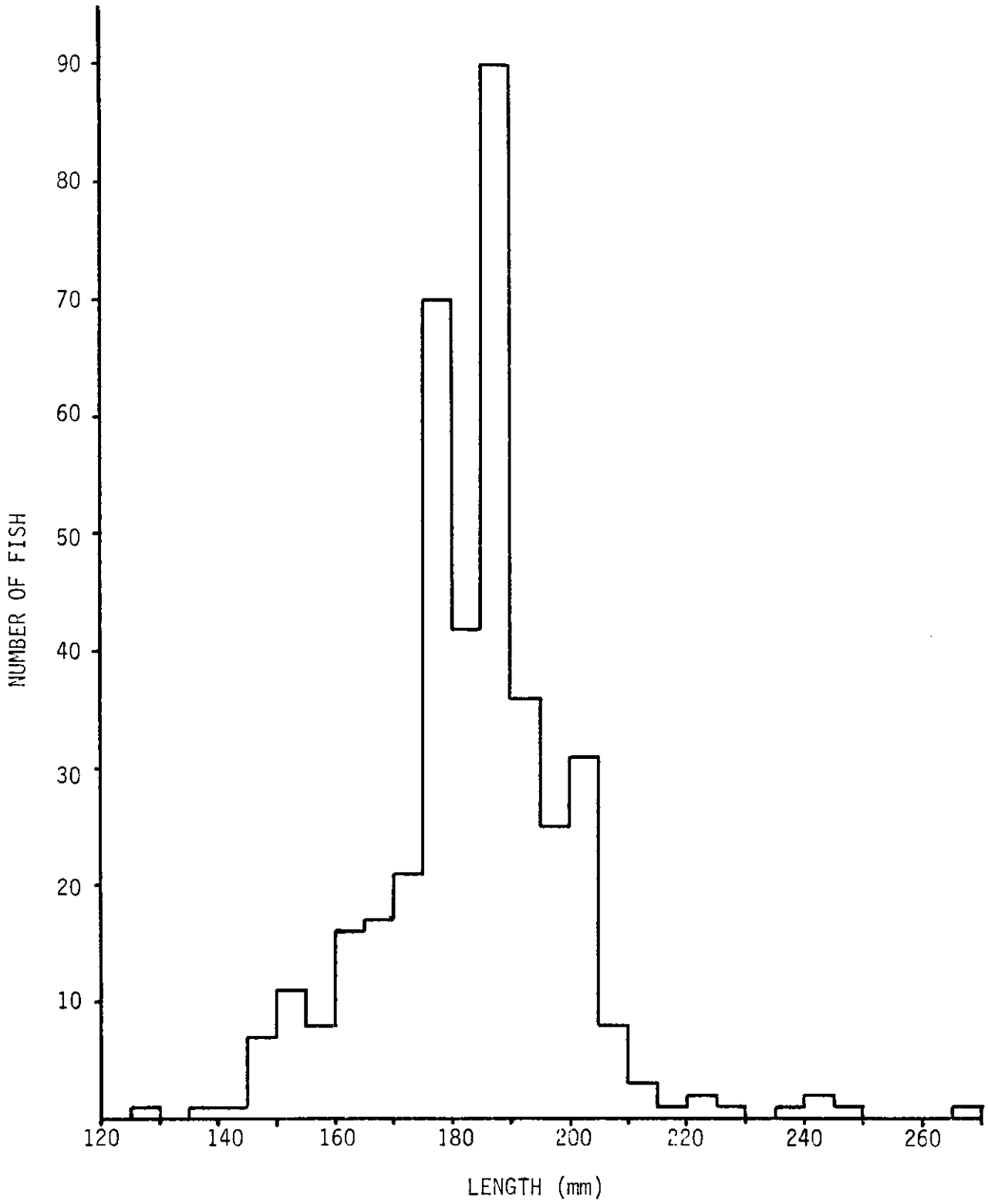


Figure 7. Length frequency of angler caught kokanee salmon in the northern end of Coeur d' Alene Lake, Idaho, May 25 to June 17, 1984.

Bay. Age 2+ fish from the 1982 release of 34,400 fingerlings supported the fishery during 1984.

Growth of the 1982 year class of chinook was very good. Chinook ranged in length from about 26 to 40 cm when they were first caught in May of 1983 (Fig. 8), 8 to 10 months after their release as 14 to 15 cm long fingerlings. A year later, these fish ranged in length from 45 to 75 cm (Fig. 8) and weights ranged from 2 to over 5 kg (Fig. 9). The largest fish reported caught during 1984 was 89 cm long and weighed 11.4 kg.

A few age 1+ fish from the 1983 release were caught during the spring of 1984. These fish ranged in length from about 16 to 32 cm, or about an average of 10 cm shorter than the 1982 year class (Fig. 8).

On September 7, 1984, we placed a block weir in the lower end of Wolf Lodge Creek to prevent chinook from utilizing high-quality spawning gravels higher in the drainage. Mature chinook entered the creek during the first freshet two days later, and we seined and sorted through several dozen fish on September 12. Approximately 80 fish were collected on the 17th, and 13 females were spawned yieiding approximately 50,000 eggs. By the 20th, most females were spent and no
eggs were collected. We estimate there were several hundred mature chinook in Wolf Lodge Creek from the 1-90 bridge upstream approximately 1 km to the weir during this two-week period. We removed the weir on October 2nd. The spent fish sunk to the bottom and quickly decomposed causing no odor or scavenging animal problems.

Data were collected on a sample of 28 mature fish that entered the creek. Female fish (21% of the sample) ranged in length from 70-79 cm (x=73 cm) while male fish (79% of the sample) ranged in length from 66 to 84 cm (x=76 cm). The percentage of jacks in the creek was very low and the only one measured was 46 cm.

The large mature chinook milling around in the lower portion of Wolf Lodge Creek created an excellent opportunity for people to view these fish, and very few complaints were heard about the lack of a fishery. There were problems with litter and bank trampling on private property that may become more serious in the future.

Kokanee

Information on the status of kokanee populations in Coeur d'Alene, Pend Oreille, Priest and Spirit lakes is in preparation and not available for this report. It is essential, however, to maintain specific trend information on an ongoing basis to effectively manage these popula-

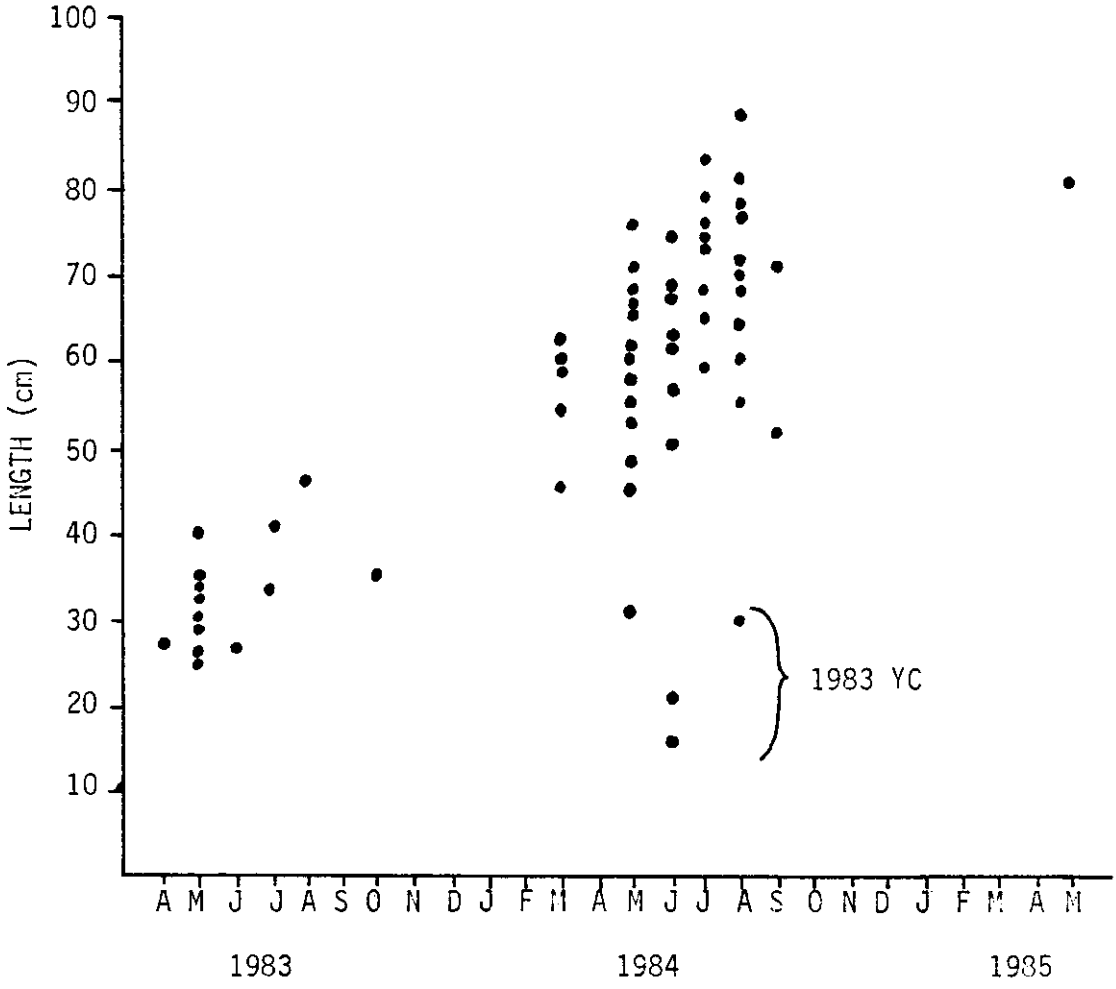


Figure 8. Total length measurements of angler-caught fall chinook salmon from Coeur d'Alene Lake, Idaho, April 1983 to May 1935.

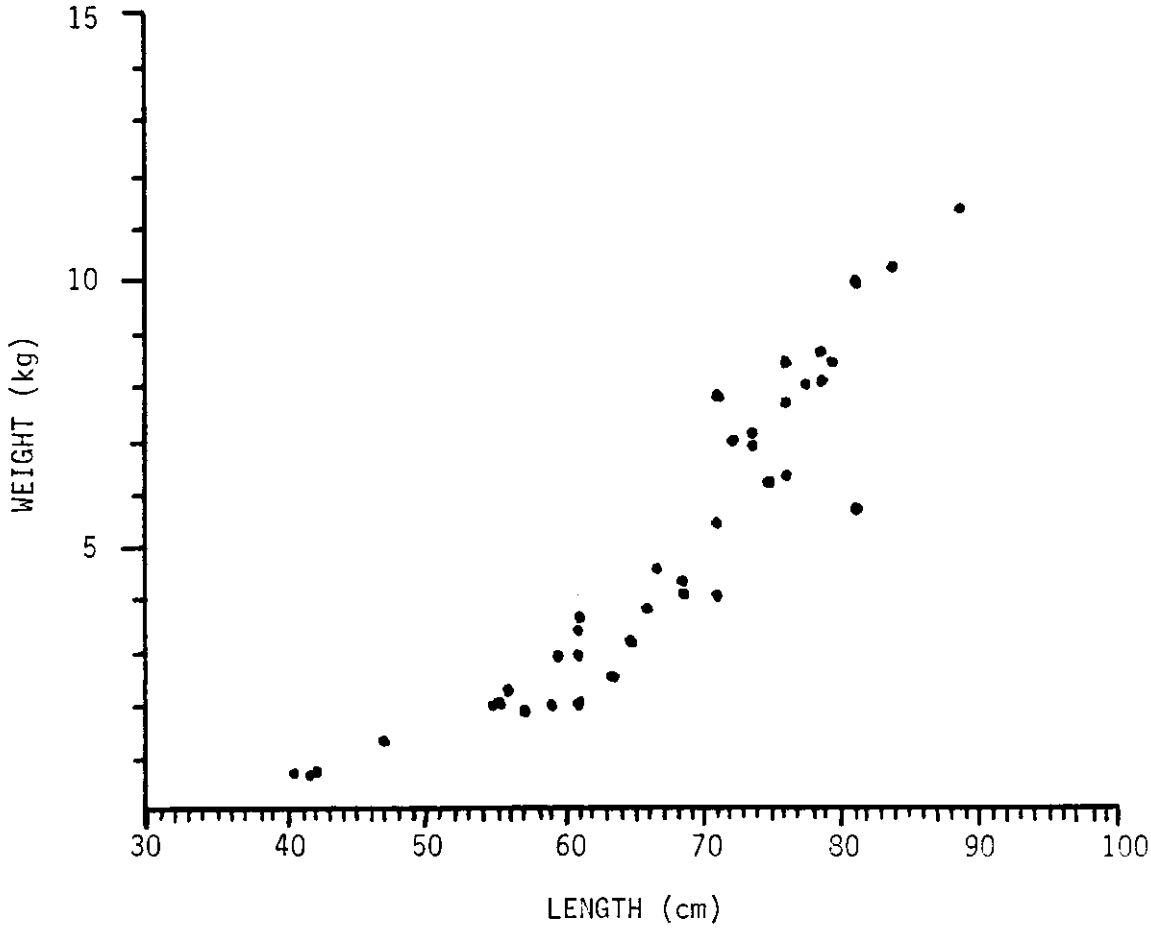


Figure 9. Length/weight relationship for 1982 year class fall chinook salmon from Coeur d'Alene Lake, Idaho.

tions. The type of data needed are: (1) age specific mortality and year class strength; (2) total estimate of population size; (3) length frequency and age class composition of spawning fish; and (4) the relative survival and contribution of hatchery-released fish.

Lowland Lake Program

Surveys

During 1984, management personnel completed partial or complete limnological and fisheries surveys on 10 lakes (Figs. 10-19). To date, data on 24 lakes have been collected (Table 10). We have not done fishery surveys in all 24 lakes.

Most of the surveyed lakes have potential low oxygen/high temperature limiting conditions for salmonids by late summer (Table 10). This information has been helpful for fine tuning catchable and fingerling trout stocking recommendations. In addition, this data can "red flag" lakes where increased cultural eutrophication could limit the success of our salmonid management activities. Increased nutrient loading could create algae blooms and increased aquatic macrophyte growth that could result in more extensive and prolonged oxygen deficits as this additional organic matter is decomposed. Several lake shore property owners associations have began nutrient loading studies as a result of the concern over cultural eutrophication.

Trout Age and Growth

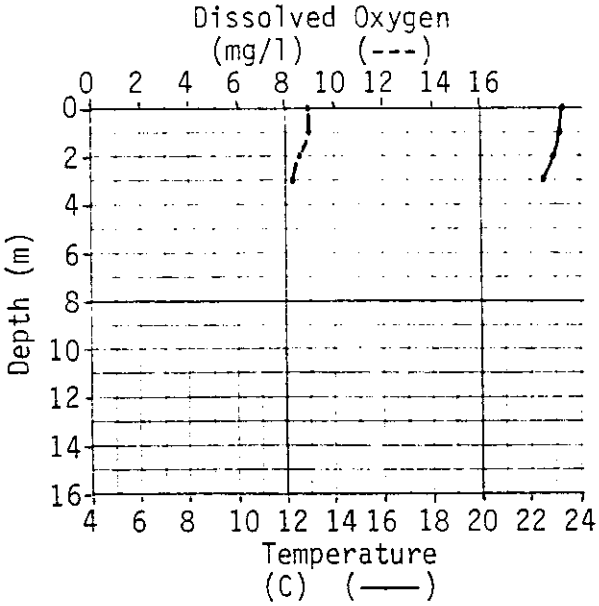
Enough data were collected on trout from Hauser, Spirit and Mirror lakes to make some growth comparisons. Rainbow trout in Hauser Lake averaged 2 to 5 cm longer at the same age as rainbow trout in Spirit Lake (Fig. 20). Both lakes are stocked primarily with catchable rainbow and some fingerlings of various species. It appears that Hauser Lake with a MEI of 1. 24 is producing larger fish than less productive Spirit Lake with an MEI of 0. 46 as would be expected. Hauser is known for its larger fish that are for the most part holdover catchable rainbow trout stocked the previous year.

Growth rate data for salmonids in Mirror Lake indicate that kokanee are growing the fastest followed by brown trout, brook trout and cutthroat trout (Fig. 21). The increase In brown trout growth from age 2 on indicates brown trout in Mirror Lake are switching to a fish diet very early. Stomach content analysis indicates that brook trout are the primary diet of brown trout.

Table 10. Physical, chemical and potential limiting factors for setmonide in north Idaho lowland lakes.

Lake	Depth (m) $\bar{X}$	Depth (m) (max)	Conductivity UMHO/L	MEI	Secchi (m)	Summer limitation factors for salmonids: Low O_2	Summer limitation factors for salmonids: High temperature
Black	4.6	(6.0)	16	4.24	3.8	high	extreme
Blue (Priest R.)	3.4	(3.7)	54	2.68	2.5	low	extreme
Brush	3.8	(5.5)	58	2.55	3.0	moderate	high
Bullrun	1.3	(2.5)	—	—	—	extreme	extreme
Chatcolet	3.4	(10.7)	51	2.50	3.8	moderate	high
Chase	2.4	(3.7)	35	2.46	2.5	low	extreme
Cocollala	8.0	(13.7)	64	1.35	3.0	moderate	moderate
Coeur d'Alene	24.3	(61.0)	50	0.35	4.0	low	low
Fernan	3.0	(7.6)	39	2.19	3.6	low	extreme
Freeman	1.8	(5.5)	81	7.73	2.5	moderate	high
Gamble	4.1	11.4)	110	4.51	4.5	high	extreme
Granite	20.8	(40.0)	235	1.91	4.5	high	extreme
Hauser	6.1	(12.2)	45	1.24	5.7	moderate	extreme
Hayden	46.2	(64.6)	60	0.22	8.1	low	low
Jewel	5.9	(10.5)	53	1.53	1.6	moderate	high
Kelso	7.7	(14.8)	97	2.14	5.8	moderate	moderate
McArthur	1.0	(3.0)	161	29.42	2.0	low	extreme
Mirror	15.9	(18.5)	69	0.73	7.0	moderate	low
Rose	2.7	(5.2)	40	2.48	3.2	high	extreme
Round	5.7	(10.4)	69	2.06	2.5	moderate	low
Smith	7.0	(12.0)	104	2.53	3.8	moderate	low
Spirit	10.5	(29.0)	28	0.46	3.6	moderate	low
Lower Twin	4.6	(10.4)	23	0.84	5.3	moderate	moderate
Upper Twin	2.4	(5.0)	24	1.71	5.0	low	extreme

BLUE LAKE (PRIEST RIVER)



Parameter	Value	Comments
Secchi (m)	2.5	
Conductivity (um/cm^2)	54	
Mean Depth (m)	3.4	
MEI	2.68	
Surface Temp.	23.2	
Date Surveyed	8/6/84	

Net collections

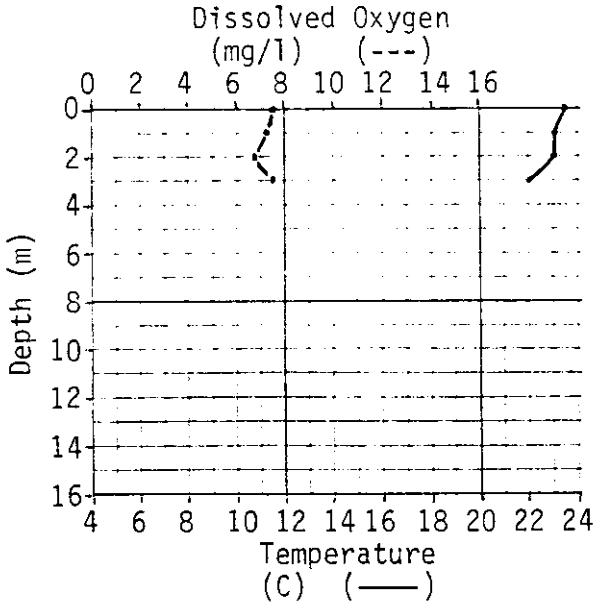
Species	n	Length (mm) $\bar{x}$	range
N.pike	1	650	--
LM bass	6	193	170-220
Perch	715	167	140-220
Bullhead	42	194	150-250

Stocking history

Year	Species	Size	Number
1973	Rb	3	3,680
	Bk	2	9,052
1974	Not stocked		
1975	Rb	3	2,520
	Bk	1	17,644
1976	Rb	3	2,510
	Bk	2	7,130
1977	Rb	3	960
1978	Stocking discontinued		

Figure 10. Limnological and biological parameters, and stocking history of Blue Lake, Bonner County, Idaho.

Chase Lake



Parameter	Value	Comments
Secchi (m)	2.5	
Conductivity (um/cm^2)	35	
Mean Depth (m)	2.4	
MEI	2.46	
Surface Temp.	23.2	
Date Surveyed	8/13/84	

Net collections

Species	n	Length (mm) $\bar{x}$	range

Not netted

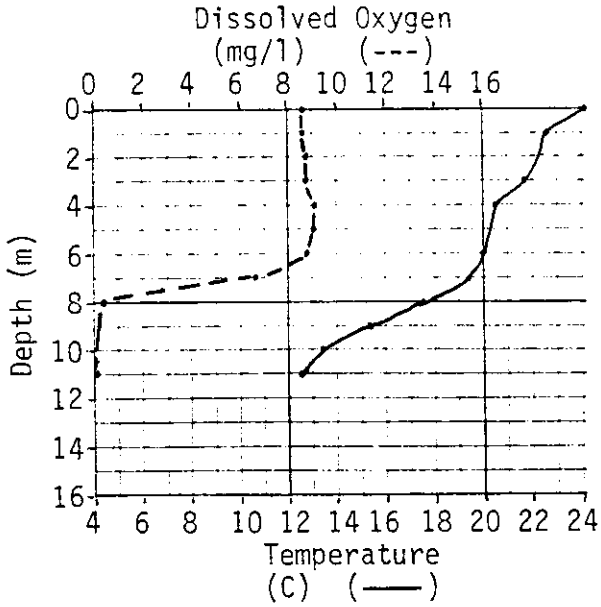
Stocking history

Year	Species	Size	Number

Not stocked

Figure 11. Limnological and biological parameters, and stocking history of Chase Lake, Bonner County, Idaho.

Cocollala Lake



Parameter	Value	Comments
Secchi (m)	3.0	range 2.8-3.1
Conductivity (um/cm^2)	63.5	range 55-72
Mean Depth (m)	8.0	
MEI	1.35	
Surface Temp.	24.0	
Date Surveyed	8/20/82, 7/10/84	

Net collections

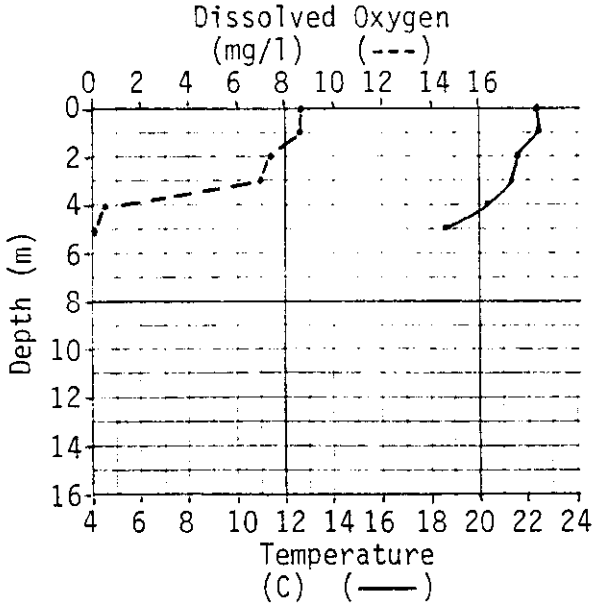
Species	n	Length (mm) $\bar{x}$	range
Rainbow	62	269	200-320
Cutthroat	4	245	190-351
Brook	3	227	190-250
LM bass	46	198	150-370
B. crappie	11	193	130-293
Perch	550	172	130-212
Sunfish	17	132	120-150
Peamouth	6	236	176-280
Sucker	85	328	160-470

Stocking history

Year	Species	Size	Number
1979	R1	3	8,375
1980	R1	3	18,360
	R2	2	20,250
1981	R1	3	13,780
1982	R1	3	4,500
	FC	2	10,011
1983	R1	3	33,853
	KL	1	10,153
1984	R1	3	6,442

Figure 12. Limnological and biological parameters, and stocking history of Cocollala Lake, Bonner County, Idaho.

Freeman Lake



Parameter	Value	Comments
Secchi (m)	2.5	
Conductivity (um/cm^2)	81	
Mean Depth (m)	1.8	
MEI	7.73	
Surface Temp.	22.3	
Date Surveyed	8/13/34	

Net collections

Species	n	Length (mm) $\bar{x}$	range

Not netted

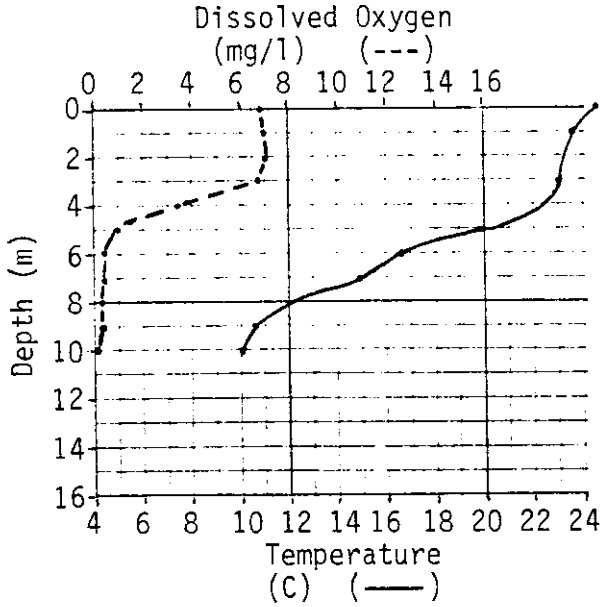
Stocking history

Year	Species	Size	Number

Not stocked

Figure 13. Limnological and biological parameters, and stocking history of Freeman Lake, Bonner County, Idaho.

Gamble Lake



Parameter	Value	Comments
Secchi (m)	4.5	
Conductivity (um/cm^2)	110	
Mean Depth (m)	4.1	
MEI	4.51	
Surface Temp.	24.2	
Date Surveyed	8/14/84	

Net collections

Species	n	Length (mm) $\bar{x}$	range

Not netted

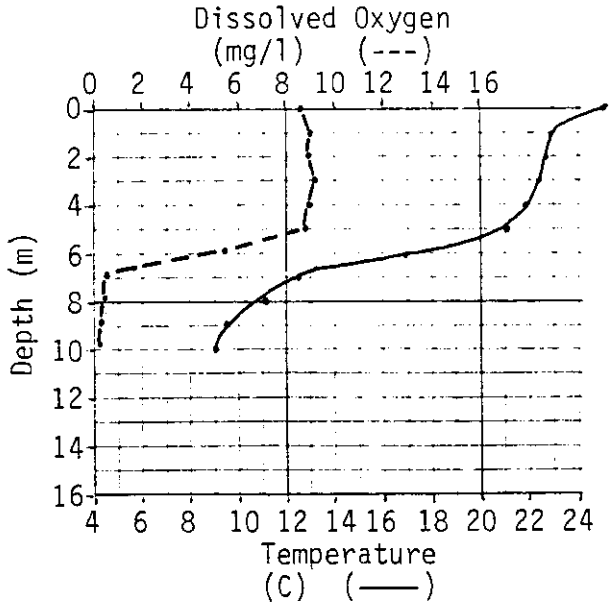
Stocking history

Year	Species	Size	Number

Not stocked

Figure 14. Limnological and biological parameters, and stocking history of Gamble Lake, Bonner County, Idaho.

Hauser Lake



Parameter	Value	Comments
Secchi (m)	5.7	range 5.2-6.2
Conductivity (um/cm^2)	45	
Mean Depth (m)	6.1	
MEI	1.24	
Surface Temp.	24.8	
Date Surveyed	8/25/82, 6/29/84	

Net collections

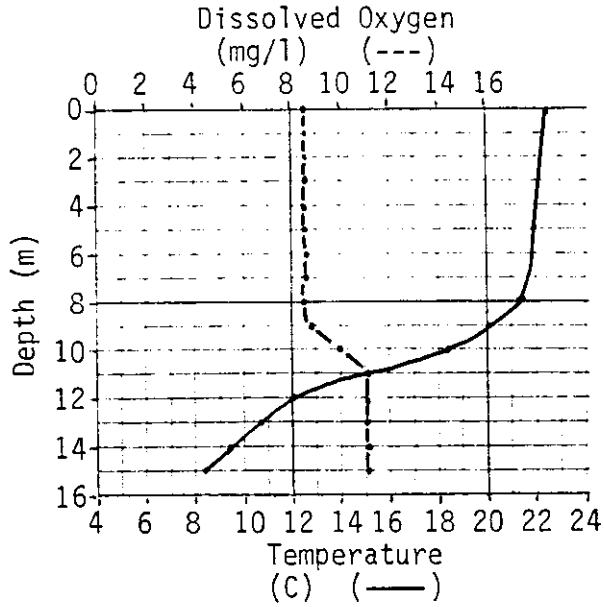
Species		n	Length (mm) $\bar{x}$	range
Rainbow	82	8	342	229-409
	84	12	260	171-413
	x	10	293	
Cutthroat		1	197	---
Brook		7	263	224-328
LM bass		7	184	150-300
B. crappie		101	176	105-244
Perch		194	190	135-253
Bullhead		22	260	190-323
Sunfish		7	134	100-195
Tench		42	365	

Stocking history

Year	Species	Size	Number
1979	R1	3	12,780
	C1	1	29,160
1980	R1	3	8,400
	K2	3	215
	K2	2	15,750
1981	R1	3	13,820
	KL	1	3,148
1982	R1	3	13,740
	FC	2	2,000
1983	R1	3	19,190
	BN	1	10,200
1984	R1	3	13,120
	K1	3	8,730

Figure 15. Limnological and biological parameters, and stocking history of hauser Lake, Kootenai County, Idaho.

Hayden Lake



Parameter	Value	Comments
Secchi (m)	8.1	range 7.4-8.7
Conductivity (um/cm^2)	59.5	range 50-68
Mean Depth (m)	46.2	
MEI	0.22	
Surface Temp.	22.2	
Date Surveyed	8/26/82, 6/20/84	

Net collections

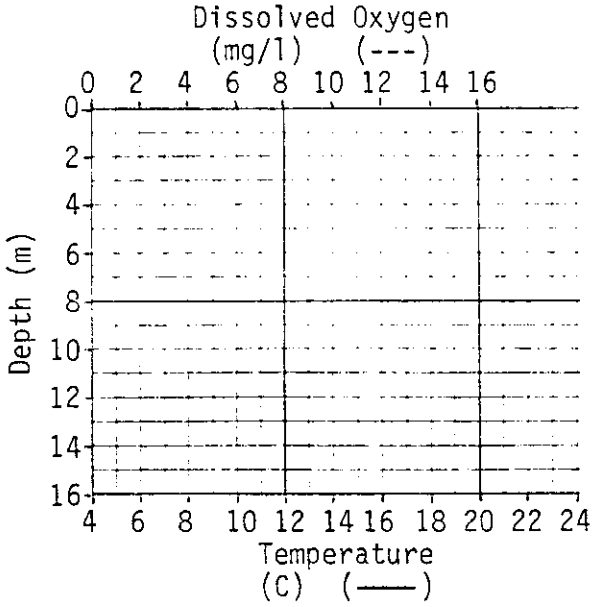
Species	n	Length (mm) $\bar{x}$	range
Rainbow	8	302	171-437
Cutthroat	6	290	196-425
Rb x Ct	1	540	---
Whitefish	2	---	260,368
Walleye	1	552	---
B. crappie	15	177	120-250
Perch	180	209	150-270
Bullhead	16	218	190-260
Sunfish	1	100	---
Squawfish	146	318	190-610
Tench	22	337	300-360

Stocking history

Year	Species	Size	Number
1979	C2	2	53,846
1980	C2	2	12,432
	RC	1	389,490
1981	C2	3	5,063
	C2	2	129,180
	R1	1	174,000
1982	C2	2	292,805
1983	C2	2	42,256
	K1	3	95,550
	K1	2	132,490
	BA	3	250
1984	K1	2	260,400
	K2	2	88,445

Figure 16. Limnological and biological parameters, and stocking history of Hayden Lake, Kootenai County, Idaho.

Kelso Lake



Parameter	Value	Comments
Secchi (m)	5.8	
Conductivity (um/cm^2)	97	
Mean Depth (m)	7.7	
MEI	2.14	
Surface Temp.	23.0	
Date Surveyed	8/23/82, 7/6/84	

Net collections

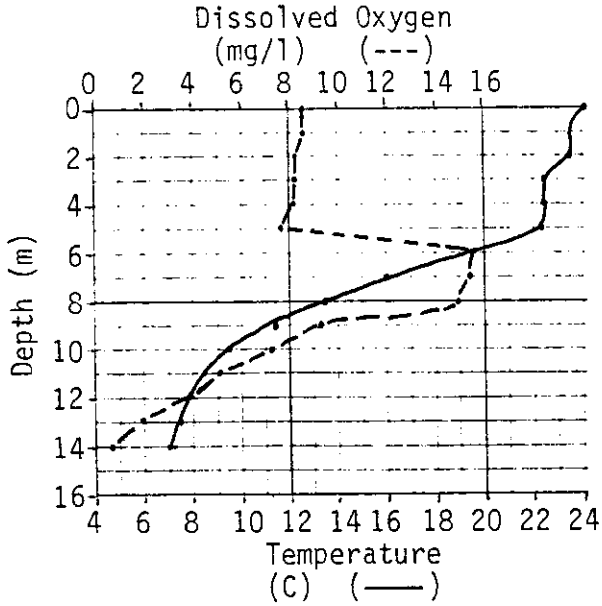
Species	n	Length (mm) $\bar{x}$	range
Rainbow	28	219	158-300
F. chinook	1	224	(in 1982)
LM bass	1	191	---
Perch	103	163	140-190
Bullhead	87	178	130-220
Bluegill	5	113	100-130
P. sunfish	60	104	97-117
Tench	8	279	130-340

Stocking history

Year	Species	Size	Number
1979	R1	3	15,208
	C1	1	109,800
1980	R1	3	10,360
	K2	3	212
	K2	2	11,250
1981	R1	3	14,410
	KL	1	1,572
1982	R1	3	10,790
	BN	3	1,040
	FC	2	1,000
	BG	2	400
1983	R1	3	10,525
	K1	3	145
	BN	1	4,250
	KL	1	1,698
1984	R1	3	12,830

Figure 17. Limnological and biological parameters, and stocking history of Kelso Lake, Bonner County, Idaho.

Mirror Lake



Parameter	Value	Comments
Secchi (m)	7.0	range 6.5-7.1
Conductivity (um/cm^2)	69	range 67-71
Mean Depth (m)	15.9	
MEI	0.73	
Surface Temp.	24.0	
Date Surveyed	8/3/83, 7/11/84	

Net collections

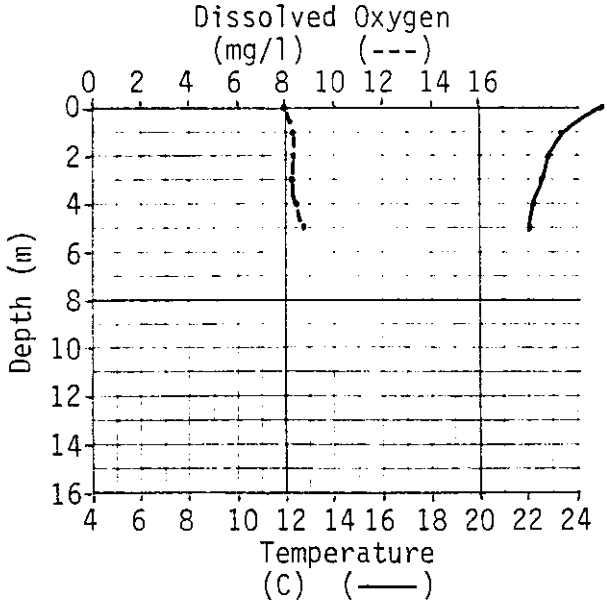
Species		n	Length (mm) $\bar{x}$	range
Cutthroat				
	83	9	169	144-197
	84	15	188	165-244
	both	24	181	144-244
Brown				
	83	6	399	368-432
	84	10	389	157-545
	both	16	393	157-545
Brook	83	30	271	174-347
	84	17	212	162-304
	both	47	249	162-347
Kokanee				
	83	1	336	---
	84	10	211	202-237
	both	11	222	202-237

Stocking history

Year	Species	Size	Number
1979	C1	1	37,212
	Bk	1	26,500
1980	C2	3	343
	C1	1	72,122
	Bk	1	35,316
1981	Bk	1	25,680
	KL	1	1,572
1982	Bk	2	9,900
	Bk	1	6,600
	KL	1	1,672
1983	Bk	2	10,604
	C2	2	10,105
	BN	1	5,100
	KL	1	2,264
1984	C2	2	5,066
	Bk	2	10,011
	KL	1	1,992

Figure 18. Limnological and biological parameters, and stocking history of Mirror Lake, Bonner County, Idaho.

Upper Twin Lake



Parameter	Value	Comments
Secchi (m)	5.0	range 4.8-5.2
Conductivity (um/cm^2)	24.5	range 22-27
Mean Depth (m)	2.4	
MEI	1.71	
Surface Temp.	25.0	
Date Surveyed	3/24/82, 7/31/84	

Net collections

Species	n	Length (mm) $\bar{x}$	range
Rainbow	9	257	221-303
Cutthroat	2	196	194-199
LM bass	6	169	160-188
B. crappie	14	185	114-233
Perch	26	162	151-208
Bullhead	6	240	182-317
Sunfish	68	105	91-140
Sucker	12	524	489-601
Tench	25	382	249-470

Stocking history

Year	Species	Size	Number
1979	R1	3	3,500
	R1	2	4,560
1980	R1	3	4,030
	K2	2	1,770
1981	R1	3	19,530
	KL	1	1,672
1982	R1	3	24,230
1983	R1	3	8,425
	KL	1	1,132
1984	R1	3	6,420
	Bk	2	7,526

Figure 19. Limnological and biological parameters, and stocking history of Upper Twin Lake, Kootenai County, Idaho.

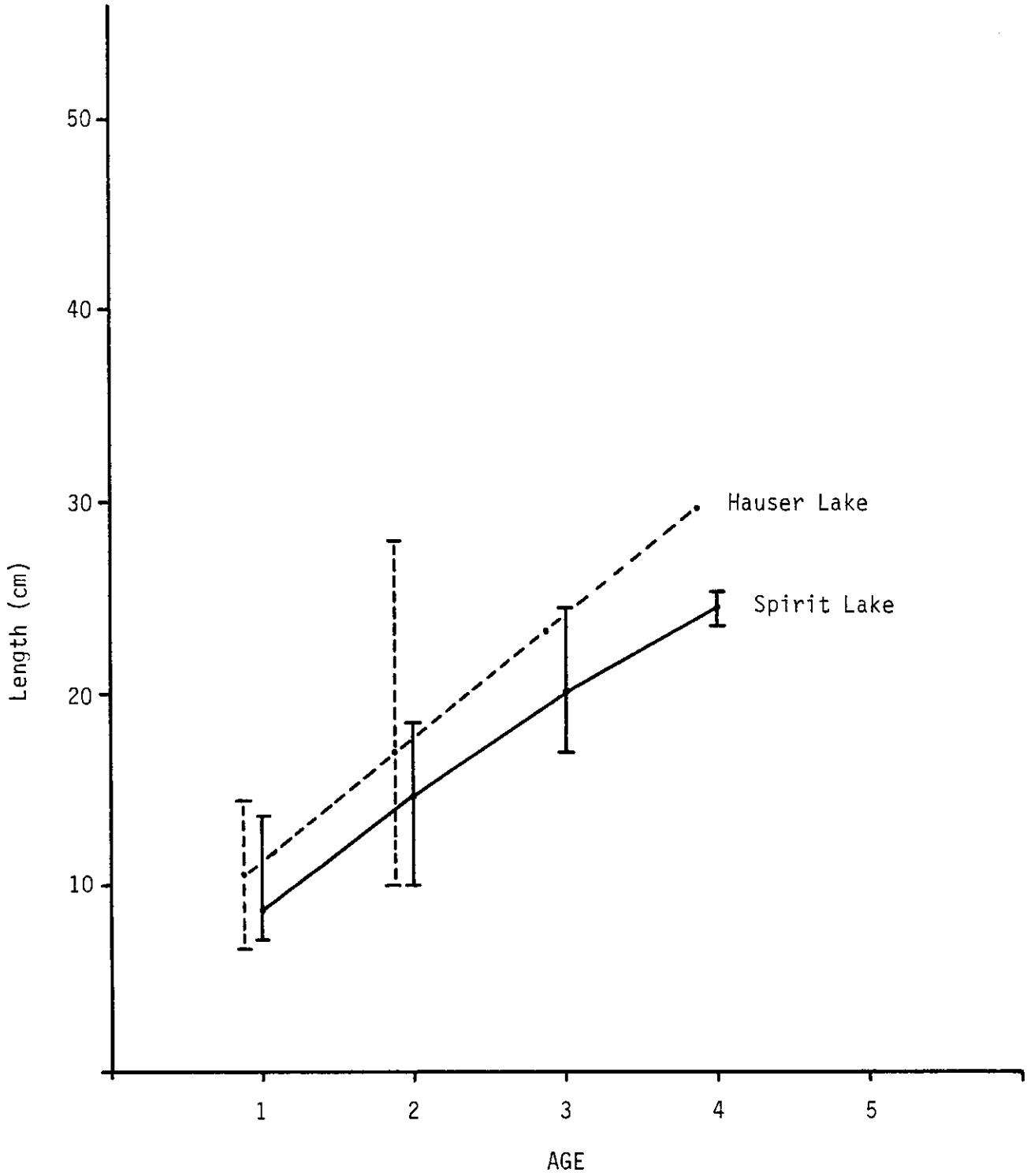


Figure 20. Back calculated length at age for rainbow trout collected in Hauser and Spirit lakes, Idaho, in 1984 and 1983, respectively.

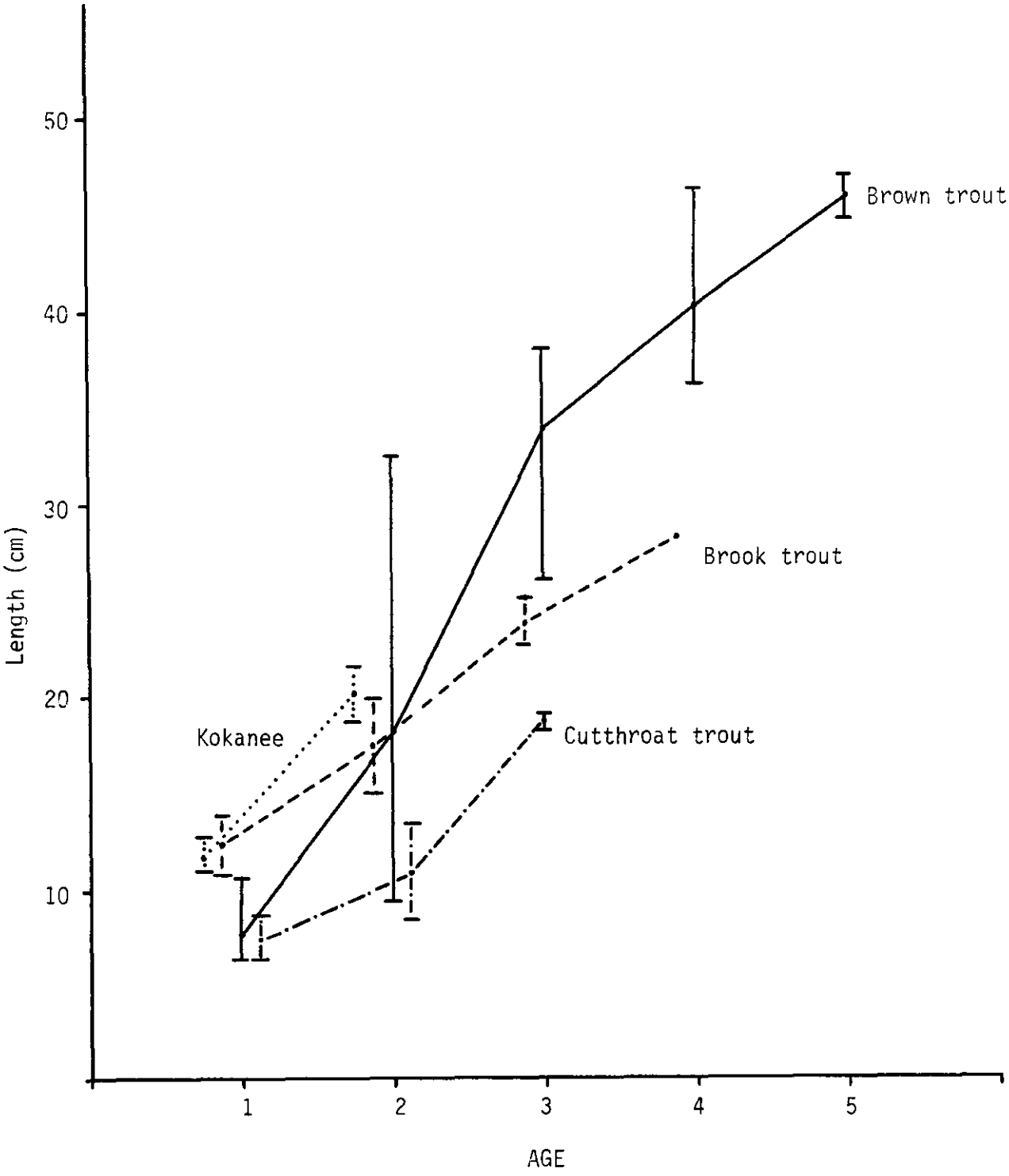


Figure 21. Back calculated length at age for brown trout, brook trout, cut-throat trout, and kokanee salmon collected in Mirror Lake, Idaho, 1983-1984.

Zooplankton

Samples were collected from 24 Region 1 lowland lakes between 1982 and 1984 and analyzed by former bio-aide Bruce Roberts as a directed study. Data on species composition, relative abundance and mean size were reported (Table 11). These data provide information on the relative health of the zooplankton community and its relation to stocking densities of fish.

Zooplankton predation by planktivorous fish, such as rainbow trout and yellow perch, is highest when zooplankton are 1.3 mm in length or larger (Galbraith 1967). Lakes with high densities of zooplankton and high percentages of zooplankton larger than 1.3 mm in length could probably withstand higher levels of predation. Conversely, lakes with low densities and small organisms should be considered for reductions in salmonid stocking and/or reductions in planktivorous fish through introductions or enhancement of suitable fish predators.

Cocollala, Chase, Round, Fernan and Brush lakes ranked in the top five for the percentage of all zooplankton greater than 1.3 mm (Table 11). All of these lakes but Chase are stocked with catchable rainbow trout and also support a diverse spiny rayed fish population. Kelso, Freeman, McArthur, Jewell and Bullrun lakes ranked the lowest of all lakes surveyed for the percentage of all zooplankton greater than 1.3 mm (Table 11). Yellow perch are very abundant in Kelso, McArthur and Jewell lakes and may be limiting zooplankton abundance for other species. Largemouth bass have been introduced in Kelso and McArthur lakes and over time should help control perch populations. Perch are so abundant in Jewell Lake that the success of the fingerling cutthroat program is marginal. Jewell Lake formerly supported a high yieid salmonid fishery similar to Mirror Lake prior to the illegal introduction of perch. Water quality conditions in Bullrun Lake are probably favoring smaller forms of cladocerans rather than planktivorous fish cropping off the larger forms (Table 11). Bullrun is extremely shallow (2-3m) and experiences very high surface temperatures and anoxic conditions on the bottom.

Miscellaneous Comments

Blue Lake (Bonner County) - has an extremely abundant population of yellow perch that does not appear to be controlled by the largemouth bass and northern pike that are present. This lake should be considered for restoration or predator enhancement to create a more desirable fishery.

Blue Lake was formerly stocked with brook trout fry and fingerlings and catchable rainbow trout up until the mid 1970's (Fig. 10) and did provide a good ice and early spring fishery. Water quality conditions in late summer severely limit trout survival, however.

Table 11. The mean density and mean size of copepods and cladocerans and the percentage of ell zooplankton greater than 1.3 mm in Length from samples collected in 24 lakes located in the panhandle of north Idaho, 1983-1984.

Lake	Density estimates [no./L]		Relative ranking by lake of density estimate		Mean size [mm]		Relative ranking by lake of mean size estimates		Zooplankton greater then 1.3 mm length	
	Copepods	Cladocerans	Copepods	Cladocerans	Copepods	Cladocerans	Copepods	Cladocerans	Percentage	Ranking
Black	22.3	18.5	3	6	.67	.91	13	10	3.1	19
Blue (Priest R.)	17.8	46.7	6	1	.59	.75	21	14	3.8	17
Brush	3.8	4.6	24	17	.42	1.21	26	3	24.3	5
Bullrun	13.0	40.2	8	2	.67	.47	13	22	0.0	25
Chatcolet($\tilde{x}$)	22.4	9.0	2	12	.70	.96	8	9	5.2	14
west end	15.1	5.7	—	—	.70	1.01	—	—	4.0	—
east end	29.7	12.3	—	—	.71	.92	—	—	6.3	—
Chase	5.9	13.2	18	9	1.37	.99	1	8	46.8	2
Cocolalla	9.9	11.2	12	10	.87	1.09	3	5	53.9	1
Coeur d'Alene($\tilde{x}$)	22.3	17.1	3	7	.61	.54	19	19	2.3	21
Wolf Lodge Bay	27.4	17.0	—	—	.64	.54	—	—	0.7	—
No. end center	17.2	17.2	—	—	.58	.55	—	—	3.9	—
Fernan	12.5	13.8	9	8	.77	1.27	4	2	28.6	4
Freeman	18.1	1.8	5	24	.47	.83	24	12	1.6	23
Gamble	7.4	5.5	17	16	.63	1.15	17	4	16.1	8
Granite	4.3	8.9	21	13	.70	.91	11	10	14.9	9
Hauser	7.6	3.2	16	21	.72	1.40	7	1	7.6	13

Table 11. Continued.

Lake	Density estimates (no./L)		Relative ranking by lake of density estimate		Mean size (mm)		Relative ranking by lake of mean size estimates		Zooplankton greater then 1.3 mm length	
	Copepods	Cladocerans	Copepods	Cladocerans	Copepods	Cladocerans	Copepods	Cladocerans	Percentage	Ranking
Hayden-1983($\bar{x}$)	4.2	4.0	22	19	.77	.66	4	18	18.2	7
north end	4.3	5.5	—	—	.74	.71	—	—	9.7	—
south end	4.1	2.5	—	—	.80	.62	—	—	26.7	—
Hayden-1984($\bar{x}$)	4.8	.75	20	25	.74	.44	6	24	9.8	11
north end	2.9	.98	—	—	.78	.33	—	—	2.7	—
south end	6.6	.52	—	—	.71	.54	—	—	17.0	—
Lower Twin	8.6	3.1	15	21	.66	.75	15	14	9.2	12
Upper Twin	3.1	4.6	25	17	.63	.42	17	26	2.9	20
Kelso	9.9	20.7	12	4	.66	.50	15	21	1.9	22
Jewel	10.7	2.4	11	23	.46	.52	25	20	0.0	25
McArthur($\bar{x}$)	4.0	9.6	23	11	.49	.47	23	23	0.6	24
north end	2.8	1.9	—	—	.38	.51	—	—	0.0	—
south end	5.1	17.3	—	—	.62	.43	—	—	1.2	—
Mirror-1983	26.8	19.9	1	5	.56	.44	22	24	5.1	15
Mirror-1984	9.9	7.0	12	15	.60	.73	20	17	3.2	18
Rose	2.2	27.3	26	3	.71	1.05	8	6	11.1	10
Round	12.1	4.0	10	19	.71	1.04	8	7	29.2	3
Smith	5.3	7.8	19	14	.88	.74	2	16	18.9	6
Spirit	14.9	.31	7	26	.70	.78	11	13	4.8	16

Blue Lake's shallow depth results in very warm water and low oxygen levels throughout the critical summer period (Fig. 10). Water quality, combined with an abundant prey base of yellow perch, creates an ideal situation for warmwater predators. The northern pike and largemouth bass populations may be limited by excessive competition with perch during their early life history stages. Introduction of large (30 cm+) channel catfish may provide a suitable predator capable of controlling perch. Limited spawning success may require annual stockings of catchable-size catfish. Channel catfish would require approval in the five year plan.

Cocollala Lake - supports a diverse spiny rayed and salmonid population. Preliminary indications of catchable trout returns to the creel were relatively poor, but more recent data indicate many catchable rainbow are caught after over-wintering. We have not seen evidence that anglers are catching kokanee, fall chinook, or brown trout. Several releases of brown trout fingerlings have been made in Cocollala Creek upstream of the lake.

The warmwater fishery could be diversified with the introduction of northern pike and/or channel catfish as was requested in the 1982-1985 five year plan. There also appears to be a need for more warmwater fish habitat structures inshore such as whole trees and brush piles. The local bass club has expressed interest in pursuing habitat enhancement. Additional creel census data is needed to determine the relative importance of the salmonid and warmwater fisheries so that enhancement efforts can be prioritized.

Fernan Lake - catch rates for hatchery rainbow trout in Fernan Lake are lower than may be desired, but return to the creel is excellent. Due to the relatively large size of the lake, it would take a major increase in the number of catchable trout released to get a significant improvement in catch rates. The current 50% return rate justifies additional stocking when fish are available.

Largemouth bass, crappies, perch, sunfish, bullheads and an occasional northern pike add diversity to the fishery. The special regulations on bass should be maintained in order to provide some "quality" fishing to the total opportunity.

Freeman Lake - supported only warmwater species prior to 1985. Limited stocking of catchable rainbow trout in the spring was recommended to diversify the fishery for anglers in the Priest River area. An officer creel census will be used to evaluate the success of this program.

Habitat for largemouth bass and black crappie could be enhanced by the placement of whole trees and brush piles along the deeper shorelines. Limited road access may require placement of habitat structure on the ice during a suitable winter.

Gamble Lake - water quality conditions are not suitable for the stocking of salmonids nor does there appear to be a demand for trout by anglers. Due to limited fishing pressure and access, Gamble Lake may be a good candidate for NO MOTORS designation or trophy bass regulations if the need for these types of fisheries are demonstrated in the future. The owner of the shoreline accessible to the public has expressed interest in upgrading launch dock and sanitary facilities. Existing structures were built by him.

Granite Lake - limnology is limiting fish distribution to the upper 5 m of this 40 m deep lake. Largemouth bass, perch, sunfish and bullheads are the only species present, and a very limited fishery occurs along the shoreline. Road and railroad bed reconstruction apparently altered the flow through the lake creating an extremely stratified lake that no longer is suitable for trout.

Hauser Lake - supports a diversified cold and warmwater fishery. Catch rates for catchable rainbow trout are acceptable, and a large percentage of the catch, both winter and summer, appears to be holdover fish. The current effort and rate of return justify additional stocking if fish are available. Additional data is needed on the winter fishing to quantify effort and harvest. The spiny rayed fishery is popular but not as productive as other waters.

Hayden Lake - management direction for trout in 1984 continued to emphasize the utilization of domestic Kamloops fingerlings and somewhat restrictive regulations (3 fish, none under 14 inches) to provide better than average angling opportunity for large trout. We have stocked over 575,000 rainbow in Hayden Lake during the past two years, the majority being domestic Kamloops, but some being progeny of wild Gerrard stock from Pend Oreille Lake (Table 12).

A few domestic Kamloops were collected in gill-net surveys in June 1984 (Table 13). We do not know from which stocking these fish originated, but the potential growth achieved by each group of fish averaged about 20 mm per month since they have been in the lake (Table 14). With this type of growth, domestic Kamloops would reach 14 inches or 356 mm in August or September the year following stocking as age 1+ fish and could, therefore, not be legally harvested until the latter half of the season.

The domestic Kamloops stocked in 1983 and 1984 were McClurry stock Kamloops from Trout Lodge, Inc., Washington. The majority of these fish mature at age $^{2+}$ and spawn anywhere from August through April (Bill Townsend, Trout Lodge, Inc., pers. comm.). If these domesticated fish show typical low post-spawning survival, we may not be able to provide anglers with trophy-sized rainbow trout or even relatively abundant numbers of legal-sized fish during most of the season. Continued monitoring of domestic Kamloops growth and maturity will be necessary to determine the success of this program.

Wild, Gerrard-stock rainbow fingerlings (age 1+) were released in Yellowbanks Creek in 1984 to facilitate future collection of eggs from

Table 12. The number and average length of domestic Kamloops and wild Gerrard stock rainbow trout released into Hayden Lake, Idaho, 1983 and 1984. Length measurements were derived from a table that converts the number of fish per pound to average length in inches.

Date	Number released	Average length (mm)	Comments
1983			
6/22/83	115,000	96	Trout Lodge Inc., WA.
8/5/83	17,490	89	egg take. Both lots
	132,490		infected with IHN.
10/4/83	51,450	157	Trout Lodge Inc., WA.
10/18/83	44,100	157	egg take.
	95,550		
TOTAL	228,040		
1984			
4/23 to 5/18/84	88,445	76	Gerrard stock from Pend Oreille Lake fish stocked in Yellowbanks Creek for egg bank purposes.
7/23/84	260,400	87	Trout Lodge Inc., WA. egg take.
TOTAL	348,845		
GRAND TOTAL TO DATE	576,885		

Table 13. Length, weight and condition factor of domestic Kamloops rainbow trout gillnetted in Hayden Lake, Idaho, June 20, 1984.

Length (mm)	Weight (G)	K (based on TL)
280	200	.91
283	205	.90
318	298	.93
321	298	.90
370	448	.88
$\bar{x}$ = 314	$\bar{x}$ = 290	$\bar{x}$ = .90

Table 14. Potential growth of domestic Kamloops rainbow trout in Hayden Lake, Idaho, based on average size at release of three groups of fish and average size at recapture on June 20, 1984.

Release group		Average size	Average size	Potential growth	
Date	Number	at release	at recapture	Total	Monthly
6/22/83	115,000	96	314	218	18.2
8/5/83	17,490	89	314	225	22.5
10/18/83	95,550	157	314	157	19.6
					$\bar{x}$=20.1 mm/mo.

these fish. The age at first spawning for wild Kamloops in Pend Oreille Lake ranges from age 3 to 7 (age 3 - 5%; age 4 - 19%; age 5 - 22%; age 6 - 37%; age 7 - 17%) (Karen Pratt, pers. comm.). We would, therefore, expect the first fish to return to Yellowbanks Creek in 1986 with better runs from 1987 through 1989. These fish not only have the potential to produce trophy-sized fish but may offer us the opportunity to collect and spawn sufficient numbers of fish to maintain the rainbow program in Hayden Lake.

We trapped adult cutthroat in Yellowbanks Creek in 1984. The work was done to evaluate returns from a 1982 release of 211,950 2-year-old fingerlings and to collect eggs for the hatchery program and experimental enhancement on Priest Lake. The trap was Installed on April 11 and removed on May 6. A total of 1,766 fish were trapped with the run peaking in mid-April (Fig. 22). Seventy-six percent of the run were female fish. Fish ranged from 32 cm to 48 cm with a mode at 38 cm (Fig. 23).

The return of 4-year-old adults from the initial release was relatively poor. The number of fish collected represents only 0.8% of the 212,000 fingerlings released in Yellowbanks Creek in 1982 (Table 15). The low return may have been influenced by straying or delayed maturity. Even with those effects, the cutthroat fingerling release program does not appear to be very promising for Hayden Lake. The return rate must exceed at least 1% for a program to even be self-sustaining. Additional research is necessary to define the best methods and benefits for artificial enhancement of westslope cutthroat. Since that effort is underway on Priest Lake, no further use should be made of hatchery cutthroat in Hayden Lake until better returns are possible.

Gilinetting in 1984 documented the presence of walleye, pike and mysis shrimp in Hayden Lake. A 552 mm walleye was caught in a gill net near the outlet in June, and three smaller walleye were picked up dead on the shore in the same area the following week. The net-caught fish had a scraped nose and frayed fins. We believe these fish were transported to the lake as large fish rather than originating from fry releases.

Mysis shrimp were collected in perch stomachs. It appears that perch, crappies and trout are utilizing mysis as a major portion of their diet. The shrimp apparently originated from a single release of several thousand mysis sometime in the early 1970's.

It appears that two year classes of smallmouth bass have resulted from the release of 250 fish in 1983. We plan to maintain the closure on all bass fishing through 1987 to enable several year classes to become well established. Largemouth bass have also responded well to the closure. Consideration should be given to reopening the bass fishery under "trophy" regulations in order to provide a high quality bass fishery close to the major population center of North Idaho.

Table 15. Westslope cutthroat trout released into Hayden Lake, Idaho, 1877-1982.

Year	Dates	Number	Stock	Mark	Size	Location	Year class
1977	21 April	30,000	Kings Lake	Adipose clip	25/lb	Hayden Creek Meadow	1975
1978	14 April-6 May	36,982	Kings Lake	Adipose clip	26/lb	Bridge 2 miles up Hayden Creek	1976
	20-25 April	11,850	Twin Lake	Left ventral	30/lb	Bridge 2 miles up Hayden Creek	1976
	1 December	3,915	Fish Lake	Left pectoral	27/lb	Boat ramp near outlet	1977
1979	12 April-5 May	53,846	Hayden and Coeur d'Alene lakes	Maxillary	42/lb	Hayden Creek at bridge	1977
1980	1-5 May	12,432	Fish Lake Hungry Horse, Cd'A Lake and Creston	Pectoral and/ or ventral	25/lb	Hayden Creek at bridge	1978
1981	23 March-21 April	134,243	Kings Lake	Adipose+ 15,000 Ad- left ventral	24/lb	Hayden Creek at bridge	1979
	1 October	529	Kings Lake	Right ventral		Skinner Bay	1980
1982	5 May-21 May	211,950	Kings Lake	Red grit (198,366 marked)	24/lb	Yellowbanks Creek	1980
	22 May	2,910	Kings Lake	Right ventral (pen reared)	27/lb	Skinner Bay	1980
	26 May-4 June	77,945	Kings Lake	30,000 adipose	30/lb	Country Club	1980
GRAND TOTAL 1977-1982		576,602					

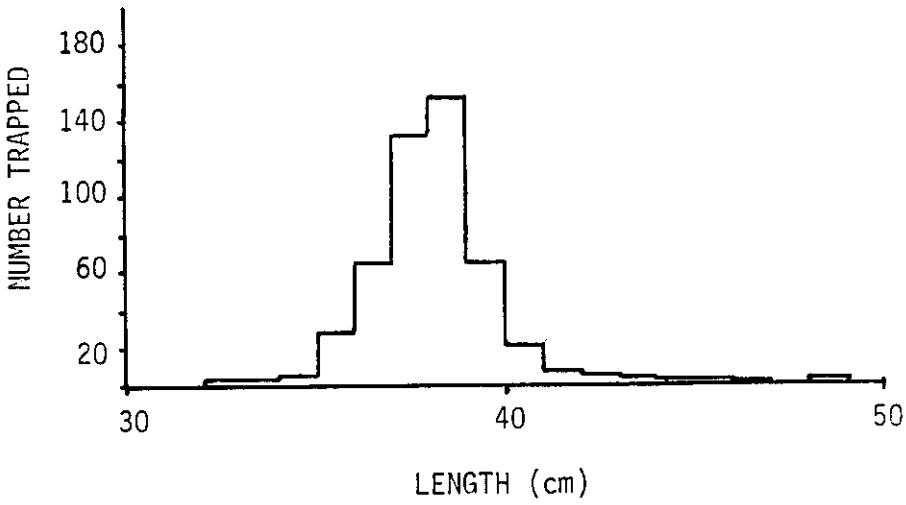


Figure 22. Length frequency of westslope cutthroat trout spawners trapped in Yellowbanks Creek, Hayden Lake, Idaho , in 1984.

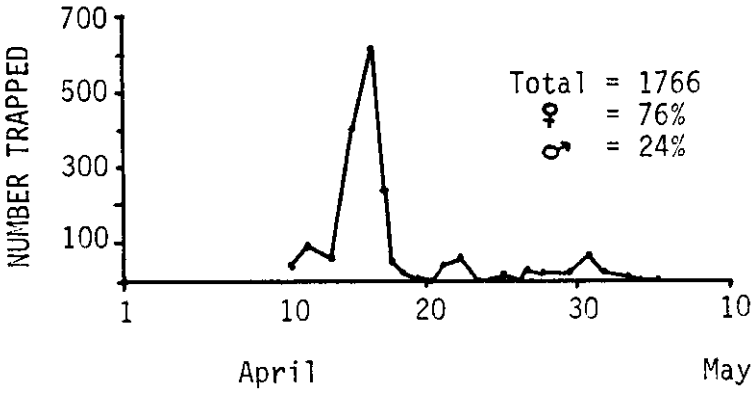


Figure 23. Temporal distribution of spawning westslope cutthroat trout trapped in Yellowbanks Creek, Hayden Lake, Idaho, during 1984.

Jewell Lake - Jewell Lake is currently in need of major management effort. Extremely abundant yellow perch have limited the success of the cutthroat trout program. Consideration should be given to a rotenone treatment and re-establishment of a salmonid only lake or an effort could be made to establish a diversified spiny rayed fishery. Jewell Lake has the potential to produce salmonid fishing similar to Mirror Lake and has been treated in the past. The presence of perch, however, indicates that illegal introductions of spiny rayed fish would most certainly occur again limiting the success of the trout program to a few years. Current effort data indicate anglers prefer trout, however, so a combination of spring stocking of catchable rainbow trout combined with enhancement of the spiny rayed fishery may provide the best overall management solution. If approved in the new Five Year Plan, potential spiny rayed fish could include largemouth bass, northern pike, black crappie and bluegill sunfish.

Kelso Lake - Kelso Lake remained closed to the harvest of bass in 1984 to protect the 100 adult largemouth that were released in 1983. The success of this introduction in establishing a self-sustaining population should be determined by beach seining in late summer. We are recommending the maintenance of this closure through 1987 to ensure the establishment of several age classes.

Five small (100-130 mm) bluegill sunfish were collected in gill nets in 1984, but scales were not collected to determine if they were progeny from the 1982 release of 400 fish.

The catchable rainbow trout program continues to be extremely popular with Kelso Lake anglers. We have not seen any evidence that fell chinook, kokanee, or brown trout are surviving and contributing to the fishery at this time.

McArthur Lake - The McArthur Lake spiny rayed fishery was further enhanced in 1984. Approximately 120 black crappie ranging in length from 175 to 250 mm were captured by rod and reel in Perkins Lake on May 24, 1984 and transferred to McArthur Lake. The fish were mature and had not spawned yet. No modifications were made in the regulations, and the success of this introduction was not assessed.

McArthur Lake remained closed to the harvest of bass in 1984 to protect the 100 fish released in 1983. The success of this introduction should also be assessed. The closure will most likely remain in effect through 1987 as on Kelso and Hayden lakes.

Rapid eutrophicatIon of the McArthur Lake is resulting in excessive aquatic macrophyte growth from late spring through the summer. Fishing seasons have been modified on McArthur to enhance goose production, and boat anglers cannot utilize the majority of the lake before it becomes choked with weeds. Bank fishing opportunities could be enhanced in the deeper north end of the lake by constructing several long fishing docks and placing fish habitat structures between them.

Mirror Lake - The Mirror Lake brook trout fishery has declined dramatically with reduced stocking levels and probable predation by brown trout. Additional creel census data is needed to determine if catch rates justify increased stocking levels.

Pend Oreille River - Return to the creel of catchable rainbow trout in the Pend Oreille River was poor due to an underdeveloped fishery or movement out of the system. The program should be advertised to increase interest, and the return to the creel experiment should be repeated. If returns do not improve, stocking should be moved to local waters that are more confined.

Additional data is needed before other fisheries can be developed or enhanced. The experimental releases of kokanee fry in Pend Oreille River tributaries should be continued and evaluated.

Perkins Lake - Perkins Lake supports a good largemouth bass and crappie fishery and is providing limited catches of brook trout. The bass fishery is good, but exploitation is relatively low. The special regulations on bass are probably not necessary. More data is needed on the brook trout population and fishery to evaluate its success.

Robinson Lake - Robinson Lake supports a productive largemouth bass, sunfish and catchable rainbow trout fishery. The bass fishery is currently good, but exploitation makes the special regulations necessary to maintain quality. Additional data is needed on the catchable trout program.

Round Lake - Round Lake receives the greatest fishing pressure of all the surveyed lakes. Catchable trout stocking rates are high and it supports excellent catch rates and return to the creel. The salmonid program should be maintained at current levels.

The spiny rayed fishery is productive. Special regulations on bass should be maintained to provide quality fishing and diversity in overall opportunity.

Spirit Lake - Spirit Lake supports a diverse salmonid and spiny rayed fishery although kokanee and catchable rainbow support most of the effort. The kokanee fishery is currently the best in the Region. Failures in recruitment can be determined by annual trawling and should be augmented to stabilize the population. Heavy fishing pressure should be maintained to avoid strong year class fluctuation and the negative effects of overpopulation.

Stocking of catchable rainbow trout provides an excellent fishery on a very short-term basis. Return to the creel is excellent. The large size of the lake, however, will limit the program to current levels because increased catch rates would not be possible without major increases in stocking.

The success of fingerling releases of domestic Kamloops and brook trout fingerlings is unknown. A marking program will be necessary to determine if fingerling releases are worthwhile.

Twin Lakes - Twin Lakes support a diverse fishery similar to Spirit Lake. Catchable rainbow trout and kokanee appear to be supporting the majority of the fishery both summer and winter. Creel census and return to the creel data is needed on both the lower and upper lake to evaluate the catchable rainbow trout and kokanee programs.

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JOB PERFORMANCE REPORT

State of: Idaho
Project No.: F-71-R-9
Job No.: Job 1-c

Name: REGIONAL FISHERY MANAGEMENT INVESTIGATIONS
Title: Region 1 River and Streams Investigations

Period Covered: 1 January 1984 to 31 December 1984

ABSTRACT

A routine officer creel census was established in 1984 to provide information on fishing effort and harvest throughout the Region. An evaluation of the hatchery catchable rainbow trout program was also initiated using the routine census and tag returns. A relationship of catch rate and stocking rate was described. The data will be used to make stocking recommendations to meet the goals of the drainage management plan.

Catch-and-release regulations were instituted on the main Coeur d'Alene River above Yellow Dog Creek in an effort to rebuild the cutthroat population and provide a diversity of angling opportunity in the drainage. The ultimate goal is to provide a limited, trophy-fish harvest. A major public information program effort has been started to improve regulation compliance.

A new evaluation of the lower Spokane River trout population was funded by Washington Water Power Company. Initial work shows that brown trout are growing well.

We surveyed Wolf Lodge Creek as a follow-up to the 1983 gas spill. Age 0 cutthroat numbers were high, indicating good survival from spawning. Older age classes were at low levels as a result of the fish kill. The trout fishery on the north end of Coeur d'Alene Lake and the Spokane River was closed in 1985 to protect the year classes of Wolf Lodge cutthroat most heavily impacted by the spill.

The reconstructed stream channel associated with the Hecla treatment ponds on the South Fork Coeur d'Alene was electrofished in 1984. Trout populations have increased since 1973, but are only 60% of original levels. Staff gauge-discharge relationships were also established on Wolf Lodge Creek, Sullivan Springs and Granite Creek to supportinstream flow requests. Data for new instream flow requests were generated for Indian, Lion and Grouse creeks.

Spawning and rearing habitat and trout populations were surveyed in the Moyie River. Spawning habitat is limited, but a moderate wild rainbow

population exists in the lower river. Growth *of Moyie* River *fish is* relatively slow.

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RECOMMENDATIONS

1. Catchable trout stocking rates of 200 to 300 total fish/km should be used on stream systems where wild recruitment is extremely limited or non-existent. Rates should be reduced if return to the creel and/or angler effort are low.

2. Additional catch success data should be collected on the North Fork Coeur d'Alene, North Fork St. Joe, South Fork Coeur d'Alene and Priest rivers and Big Creek. Estimates of return to the creel should be obtained on the Coeur d'Alene, St. Joe and Priest rivers.

3. To ensure maximum compliance and best possible biological responses, every effort should be made to inform anglers of (and the reasons for) new regulations on the Coeur d'Alene River system. Enforcement of these regulations should be a Region 1 priority.

4. The trout closure on Wolf Lodge Creek, North Fork Coeur d'Alene and the upper Spokane River should be maintained through 1987 to ensure protection for cutthroat year classes impacted by the Wolf Lodge gasoline spill.

5. Many of the drop log structures in the Hecla channel of the South Fork Coeur d'Alene have failed. The Department of Water Resources should be encouraged to require the company to rebuild and maintain the structures and stream channel.

6. An instream maintenance flow recommendation for spawning and rearing habitat was prepared for Grouse Creek. That recommendation should be formalized before the Water Resource Board.

7. Kootenai River rainbow fingerlings were stocked in Deer Creek in an effort to enhance the Moyie River wild rainbow stock. The survival and distribution of fish from that release should be evaluated.

8. A culvert in Meadow Creek at the Spokane International railroad crossing represents a block to some of the best spawning and rearing habitat for the Moyle River. The feasibility of re-establishing access to Meadow Creek should be pursued.

OBJECTIVES

Determine relative abundance, density and age and growth data for wild and hatchery stocks of trout.

Determine availability of spawning, rearing and overwintering habitat and existing and potential uses of the habitat by trout.

Determine instream flow requirements for trout.

TECHNIQUES AND FINDINGS

Routine Census

During 1984, we initiated a routine data collection program to describe fishing *effort* and success on Region 1 waters. Most of the data were collected by conservation officers, but other personnel assisted. The intent of the program is to provide long-term data on water that may not be evaluated in other programs. Data will be used to evaluate the success of management programs. Data were collected on eight segments of river systems within the Spokane River drainage in 1984. Table 1 shows information from 1984 along with the last relevant information available for each stream. Catch rates on all streams appeared to be reasonably good with the exception of the Spokane River. Fishing pressure ranged from 282 hours/km on the general regulation section of the St. Joe River to over 1,000 hours/km on the Spokane River and Marble Creek.

Catchable Rainbow Trout Program Evaluation

Catchable stocking in Region 1 rivers and streams has been used to provide fisheries where wild recruitment is extremely limited or non-existent. They have also been used to augment wild trout fisheries where recruitment is limited or fishing pressure is high and special regulations are not acceptable.

In 1984, we used conservation *officer* census data, historic data and tag return data to evaluate the catchable program. Tag return data were corrected for non-compliance using reward tags. The estimated return of catchables ranged from 3% to 27% on study streams. Catch rates supported by hatchery fish ranged from 0.21 fish/hour to 0.81 fish/hour (Table 2). Catch rate appeared to be a function of stocking density (Fig. 1). In systems where wild production is severely limited and fishing pressure is heavy enough to result in a significant return, stocking densities to provide catch rates of approximately 0.5 fish/hour may be appropriate. Stocking goals of 200 to 300 fish/km would appear suitable for Upper Moyie, Coeur d'Alene, and the St. Manes rivers. Additional data is necessary to evaluate the other systems. However, until data is available, stocking rates to support catch rates of 0.20 to 0.50 fish/hour appear reasonable for the St. Joe, North Fork, Big Creek and the North Fork Coeur

Table 1. Routine census data collected on Region 1 rivers and streams during 1984.

River		N	KM in section	$\bar{X}$ anglers	$\bar{X}$ anglers/KM	Est. hours/KM	Est. total hours	Catch rate fish/hour HRB	WRB	CT	Total
Coeur d'Alene River											
General Regulation	1984	(184)	54	20	.37	666	36,000	.40	.02	.10	.52
	1980-1981		77	—	—	530	40,704	—	.05	.10	.15
South Fork Coeur d'Alene River		(15)	19	5	.26	—	—	.73	—	.76	1.50
St. Maries River	1984	(15)	—	—	—	—	—	.50	—	—	.50
Marble Creek	1984	(76)	16	13	.81	1,462	23,400	.21	—	2.01	2.22
St. Joe River											
General Regulation	1984	(122)	51	8	.16	282	14,400	.16	—	.17	.33
	1973	—	63	—	—	332	20,950	.21	.08	.16	.45
Special Regulation	1984	—	38	12	.31	568	21,600	—	—	2.00	2.00
	1975	—	—	—	—	100	—	—	—	3.00	3.00
Lower Spokane River	1984	(181)	9.2	—	—	—	—	—	.20	—	.20
	1981	—	—	—	—	1,086	10,000	—	.15	—	.15

Table 2. Catchable trout stocking, catch rates and rate of return for Region 1 rivers and streams.

River	KM	Stocking rate fish/KM	Estimated percent return	Catch rate	Fishing pressure hours/KM	Total hours
Coeur d'Alene	54	256	—	0.40	530	40,000
North Fork Coeur d'Alene	19	313	—	—	—	—
St. Joe	64	144	—	0.21	282	14,000
Marble Creek	19	50	—	0.21	1,462	23,000
North Fork St. Joe	35	263	—	—	—	—
St. Maries	24	144	22%	0.50[1]	—	—
Big Creek	10	156	—	—	—	—
Priest	48	413	3%	—	—	—
Moyie	35	400	27%[2]	0.81[2]	142	5,000
South Fork Coeur d'Alene	16	375	8%	0.73[1]	—	—

[1]Limited data.
[2]1975 data may not be applicable to current conditions.

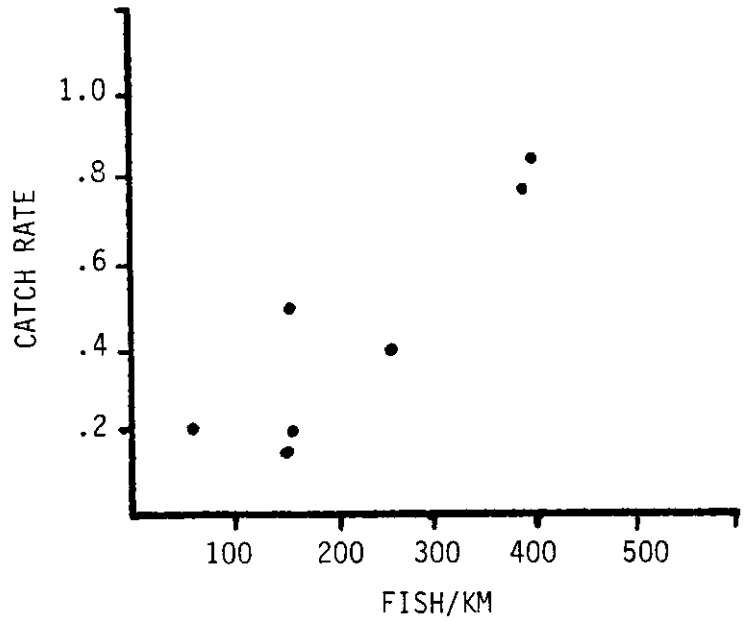


Figure 1. Relationship of catchable stocking density to catch rate for Region 1 rivers and streams.

d'Alene rivers. Goals of approximately 150 fish/km may be appropriate depending upon fishing pressure and relative contribution of wild fish. Other data indicate that Marble Creek supports a good wild trout fishery and a modest release of catchables is necessary only to support very heavy fishing pressure in localized areas. Return to the creel was low for the Priest River and the South Fork Coeur d'Alene. Catch rates in the South Fork were good, suggesting good survival of fish. No data is available on the Priest River to determine whether the poor return is a function of low fishing pressure or poor survival. Additional data is necessary to justify maintenance of current stocking rates on the Priest River and South Fork Coeur d'Alene. Efforts should be made to focus fishing effort on those systems.

Emphasis for new creel data will be placed on the North Fork Coeur d' Alene, North Fork St. Joe, South Fork Coeur d'Alene and Priest rivers and Big Creek. Estimates of return to the creel should concentrate on the Coeur d'Alene and St. Joe rivers and again on the Priest River.

Coeur d'Alene River

Wild trout regulations (3 fish; none under 13"), instituted on the Coeur d'Alene River in 1975, stopped the decline of westslope cutthroat, but did not result in any significant increase in the population or fishery of the main river (Lewynsky and Bjornn 1983). Present populations in the main river appear to be considerably below maximum possible levels, and the fishery obviously has not responded to special regulations in the fashion of the St. Joe.

Several factors may have influenced the lack of response. Mortality of cutthroat age 3 and older did not change significantly following the regulation changes. Regulation non-compliance may be important (Lewynsky, pers. comm.). Growth of cutthroat is also much better than St. Joe fish and growth originally anticipated for the Coeur d'Alene (Fig. 2). The 13-inch size limit may not provide adequate protection for prespawning fish. Finally, habitat loss has occurred throughout the drainage as a result of timber harvest and road construction. Although the impact of habitat degradation has not been well quantified, channelization and sedimentation in tributaries may have resulted in a significant reduction in potential production of spawning and rearing habitat.

The 1981 drainage management plan recognized the Coeur d'Alene system had not responded to its potential and directed that a new management direction be evaluated through the public. An informational survey of anglers was conducted on the river in 1982. That work indicated that anglers using the Coeur d'Alene system, both in general regulation and special regulation areas,

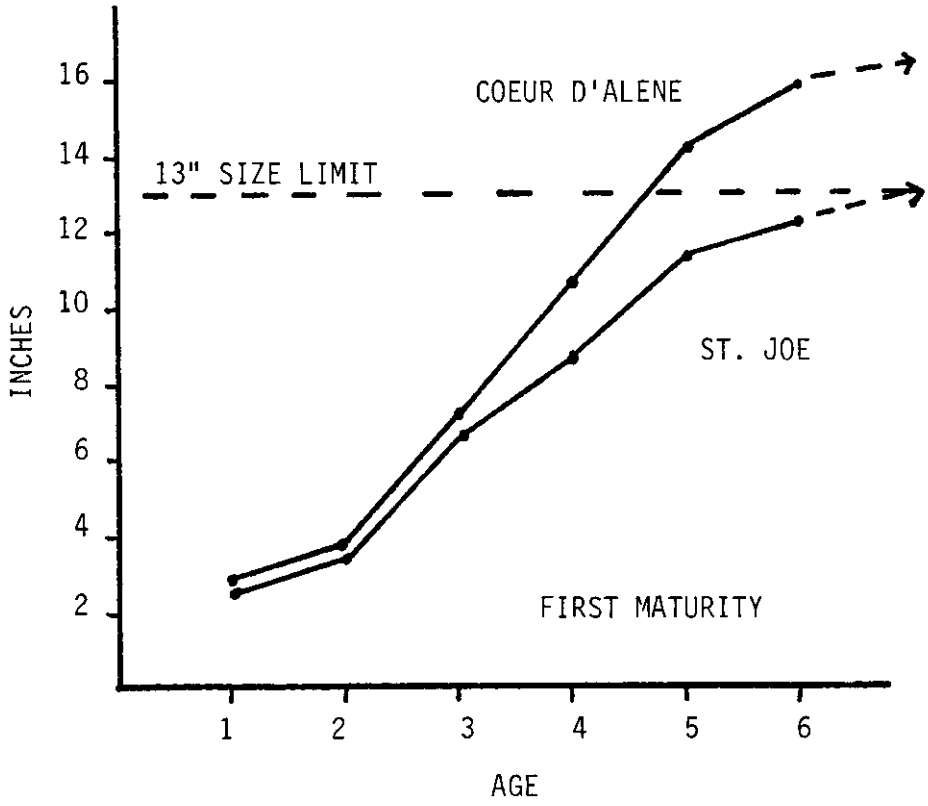


Figure 2. Length at age for cutthroat from the St. Joe River and from the Coeur d'Alene River.

supported restrictive regulations to manage for wild cutthroat (Mauser and Horner 1983). In 1984, we conducted a mail-in survey by contacting anglers with an information packet (Appendix A) on the river. The packet discussed past management and biology and described management alternatives for the future. Alternatives ranged from a return to general regulations to a complete closure on segments of the river. Approximately 150 packets were given to anglers who said they were "interested" in management of the river. An attempt was made to distribute packets evenly throughout the system. We also held public meetings in Kellogg and Coeur d'Alene where the same information and survey were provided to interested sportsmen. The majority of anglers surveyed came from the Kellogg-Wallace area (Table 3). Seventy-five questionnaires were returned by mail-in and 44 people attended the public meetings. In both cases, respondents strongly favored the more restrictive regulations with catch-and-release fishing on some portions of the river mentioned most often (Table 4).

Because of unknown limitations in the habitat, we felt the most restrictive regulation acceptable to the public would provide the best chance of response in the fishery. Because of the diversity of angler preference and stream type, we also felt that a mix of fishing opportunity may be the best approach to the Coeur d'Alene system. Because of high growth rates, the main Coeur d'Alene River has the best potential to produce large fish under more restrictive regulation. The North Fork of the Coeur d'Alene may not respond further to more restrictive regulation since growth is similar to the St. Joe (Lewynsky, pers. comm.). The regulation package, proposed in 1984 and enacted by the Commission for 1985, included catch-and-release fishing on the main river above and including Yellow Dog Creek, maintenance of the existing 3 fish, 13" minimum size limit on the North Fork Coeur d'Alene River above Laverne Creek and general regulations on the lower section of both rivers. The goal of the next Five Year Management Plan will be to provide catch rates of 2.0 fish/hour or greater with 10% of the catch exceeding 13" in the main river above Yellow Dog Creek. It is also a goal to provide some harvest of large cutthroat if possible. Harvest of large fish may be realized by displacement of fish from the catch-and-release section to the general regulation section. The response of cutthroat population dynamics will be evaluated during the 4th and 5th years of regulation (1988 and 1989). If the management can be met with harvest, a regulation change will be recommended to allow a limited kill of large fish.

We recognize that compliance of regulations may be a critical factor influencing success. To maximize compliance, we have initiated a major signing and informational program to ensure that most anglers are informed of the reason for new regulations and of the alternatives for other angling opportunity in the same area. Along with routine news releases, large interpretive signs and brochures (Fig. 3) will be placed or made available throughout the

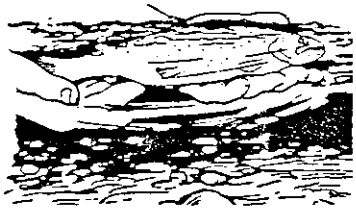
Table 3. Area of residence for anglers contacted on the Coeur d'Alene River system in 1984.

	Kellogg-Wallace area	Coeur d'Alene/ Post Falls Hayden Lake	Spokane	Other
Percent Anglers Contacted	55%	34%	8%	3%

Table 4. Percent of regulation types mentioned as among the preferred alternatives for future management of the Coeur d'Alene River.

River	ALTERNATIVE					
	Return to general regulation	No change	1 fish limit	Increased size limit	Catch-and-release fishing	Temporary closure
Mail-in (N=75)	1%	7%	23%	41%	53%	36%
Public Meeting (N=44)	0%	0%	32%	26%	77%	30%

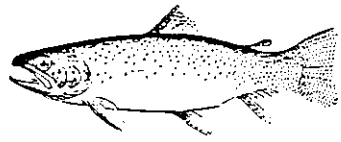
RELEASING FISH



Key steps to insure that a released fish has the best chance for survival.

1. Play fish as rapidly as possible — do not play to total exhaustion.
2. Keep fish in water as much as possible when handling and removing hook.
3. Remove hook gently, do not squeeze fish or put fingers in gills.
4. If fish is deeply hooked, cut the line — do not pull the hook out. Most fish will survive and the hook will rust out quickly.
5. Release fish only when it can maintain itself upright and swim away. If necessary, hold fish upright and gently move it back and forth in the water.

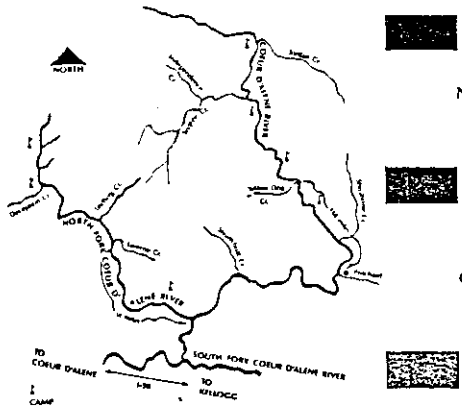
Coeur D'Alene River Special Fishing Regulations



The Coeur d'Alene River supports unique populations of wild trout, both westslope cutthroat and rainbow. The cutthroat have been particularly vulnerable to heavy fishing pressure and loss of habitat. Special fishing regulations and habitat protection plans have been implemented on this river system in an effort to maintain or improve the numbers and size of fish available to anglers. These programs are designed to produce much better fishing, but this will only occur with the support of all fishermen.

IDAHO DEPARTMENT OF FISH AND GAME

COEUR D'ALENE SPECIAL REGULATIONS



Coeur d'Alene River and Tributaries below Yellow Dog Creek (and North Fork Coeur d'Alene River below Laverne Creek) — 6 trout limit, only 2 over 16". (No restriction on bait or tackle.)

North Fork Coeur d'Alene River and Tributaries above and including Laverne Creek. Wild trout limit — 3 over 13". Artificial flies and lures only (no bait). Single barbless hook required. Note: It is illegal to fish in this area with more than 3 fish, or any fish under 13" in your possession.

Coeur d'Alene River and Tributaries above and including Yellow Dog Creek. Trout — CATCH-AND-RELEASE. Artificial flies and lures only (no bait). Single barbless hook required. Note: It is illegal to fish in Catch-and-Release water with any fish in possession.

Additional Fishing Regulation Information is available at Idaho Department of Fish and Game 600 S. Walnut, Boise, Idaho 83707

Figure 3. Brochure describing Coeur d'Alene River regulations to be distributed to anglers throughout the system.

areas. The Region 1 plan process has also identified the Coeur d'Alene River system as an enforcement priority.

Spokane River

The Spokane River from the Post Falls dam to the state line has historically provided a high quality fishery for rainbow trout. Large fish have been common in the catch. Available data (Bailey and Salles 1982) indicate that densities are lower than other segments of the river but do not indicate what the population limitations may be. Some concern has been voiced by local sportsmen that the fishery is declining. Fishing pressure is relatively high (1,000 hours/km). The river Is influenced by operation of the Post Falls dam, and spawning habitat may be limited. In order to better define population limitations, funding for new research was sought and obtained through the Washington Water Power Company. A University of Idaho graduate research program will be initiated in 1985.

Approximately 100,000 brown trout fingerlings were introduced in the Spokane River in 1984. An initial release was made in 1983 in an attempt to establish brown trout, diversify the fishery and take advantage of an excellent forage base of long-nose dace. We fished the river in October of 1984 and collected three fish all approximately 30 cm long. Initial growth appears to be good. Further evaluation of the program will come with the new research project.

The upper Spokane River near the lake outlet supports a short-term, but very productive and popular cutthroat fishery each year in late May and early June. A cursory census in 1983 estimated that approximately 5,000 angler hours were expended and over 4,000 fish were harvested in a three-week period. An effort census in 1984 indicated 3,800 hours were expended during the same period (Table 5).

Tagging data indicates that many (or all) of the fish moving into the Spokane River were produced In Wolf Lodge Creek. Harvest of several thousand fish could represent significant exploitation on that stock. In 1983, a gasoline spill in Wolf Lodge Creek resulted in major losses of several year classes. Those year classes will be recruited to the fishery in the lake and river during 1985, 1986 and 1987. In an effort to help the population rebuild as quickly as possible, a closure to harvest of trout was imposed on the north end of the river and the lake in 1985. We anticipate maintaining the closure for three years.

Table 5. Estimated effort, catch rate and harvest of cutthroat trout in the Spokane River above Post Falls Dam, May 23 to June 12, 1983 and May 26 to June 17, 1984.

	Anglers interviewed	Fish/hour	Estimated angler hours	Estimated harvest
1983	158	0.83	4,938	4,098
1984	--	--	3,852	--

Wolf Lodge Creek

We surveyed a portion of Wolf Lodge Creek that was impacted by the June 4, 1983 gasoline spill to assess impacts to and potential recovery of the westslope cutthroat trout population. Three transects between the spill site and the school house bridge (approximately 3.2 km or 2 miles below the spill site) were snorkeled on August 1, 1984, and numbers of age 0 and 1+ and age 2+ and older fish were enumerated (Table 6).

Densities of age 0 and 1+ fish observed in 1984 indicated that the 1984 spawning run was fairly normal and fry production was good (Table 7). The average density of age 0 and 1+ fish in 1984 was about three times that observed in 1976 (61.3/100m^2 in 1984 versus 21/100m^2 in 1976). Nearly all of these fish were fry. The higher densities of age 0 and 1+ fish in 1984 may also be due to the lack of competition and direct and indirect predation by older age class fish that were eliminated in the spill.

Age 2+ and older fish observed in 1984 were less than half as numerous as they were in 1976 (Table 7), indicating the spill had major impacts on the Juvenile pre-smolt population as was anticipated by the timing of the spill and life history patterns of the fish.

Younger brook trout were also more numerous in 1984 than they were in 1976 in the area affected by the spill (Table 7), but cutthroat trout still dominated. Older age classes of brook trout in 1984 are about as numerous as they were in 1976 (Table 7).

Hecla Channel

In November 1972, a portion of the upper South Fork Coeur d'Alene River above the town of Mullan was relocated to facilitate the construction of settling ponds for mine wastes from the Hecla mining operation. The existing fish populations were removed (Table 8) and held at the Mullan Hatchery until they could be placed back into the reconstructed channel.

Twelve drop log structures and one rock dam were constructed to control the gradient in the straightened channel and numerous wing deflectors and undercut bank structures were placed in the channel to create fish habitat. Willows were planted along the bare banks to stabilize the channel slopes and create riparian plant cover.

The Hecla channel was electrofished on August 1, 1973 and August 29, 1984 to determine the relative abundance and diversity of the fish populations in the reconstructed channel. It appears that wild cutthroat trout have increased during the 12-year post-construction period but were still only about 60% as numerous as the original population (Table 8). Brook trout had decreased and wild rainbow trout and rainbow/cutthroat hybrid trout were present in 1984, but not in great numbers (Table 8). The

Table 6. Observed fish densities (fish/100m^2) in transects in Wolf Lodge Creek, Idaho, August 1, 1984, effected by the gasoline spill of June 4, 1983.

Transect location	Transect area [m^2]	Cutthroat trout densities [fish/100m^2]		Brook trout densities [fish/100m^2]	
		0 to 1+	2+ and older	0 to 1+	2+ and older
School house bridge	547.3	75.0	10.0	8.5	.5
200 m above school house bridge	239.4	85.0	2.4	0.0	0.0
500 m below gas spill location	380.0	23.9	7.3	0.5	2.3
Average of all transects combined		61.3	6.6	3.0	.93

Table 7. Observed fish densities (fish/100m^2) in a portion of Wolf Lodge Creek, Idaho, before [1976) and after [1984) the June 4,

Year	Transect area surveyed [m^2]	Average Fish Densities [fish/100m^2] Observed Cutthroat trout		Brook trout	
		0+ to 1+	2+ and older	0 to 1+	2+ and older
1976	3,053.2	21.0	15.33	.42	1.05
1984	1,166.7	61.3	6.6	3.0	.93

Table 8. The number of fish collected by electrofishing the reconstructed portion of the South Fork Coeur d'Alene River adjacent to the Hecle Mining Company settling ponds above Mullen, Idaho, November 1972, August 1873 and August 1884.

Date	Number of each species[1] collected								
	CT	WRB	HRB	RBXCT	BK	KOK	CO	CK	SC
November 2 and 10, 1972 (fish salvaged from original channel)	568	—	9	—	74	—	663	—	75
November 28, 1972 (fish released back into reconstructed channel)	566	—	8	—	73	—	0	—	30
			(Total wild trout present 639)						
August 1, 1973	229	—	6	—	40	—	3	—	81
			(Total wild trout present 269)						
August 29, 1984	343	14	71	19	11	15	—	44	598
			(Total wild trout present 387)						

[1]Fish species:
CT - Wild westslope cutthroat.
HRB - Hatchery rainbow trout.
RBXCT - Rainbow/cutthroat hybrids.
BK - Brook trout.
KOK - Kokanee salmon.
CO - Coho salmon.
CK - Chinook salmon.
SC - Sculpin.

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increased presence of hatchery rainbow trout in 1984 was due to an active stocking program for catchable rainbow compared to escaped fish from the Mullen Hatchery in 1973. The presence of coho and chinook salmon in the Hecla channel was also due to loss of juvenile fish from the Mullen Hatchery. The prespawning adult kokanee salmon in the Hecla channel in 1984 were either a small return from escaped juvenile fish from Kilian Hatchery or fish that were pioneering new territory due to very high densities of fish In Coeur d'Alene Lake. Sculpin were very numerous in 1984 relative to the earlier collections (Table 8).

All of the fish collected in 1984 were less than 30 cm. The appearance and size distribution (Fig. 4) of westslope cutthroat in the Hecla channel suggests the population was a mixture of small resident fish and juvenile adfluvial or fluvial cutthroat from the Coeur d'Alene Lake or river system. The majority of wild rainbow and rainbow/cutthroat hybrids collected in 1984 were also small, suggesting they are premigratory fluvial fish.

The distribution of fish in the channel in 1984 was very strongly associated with the deep pools formed behind the drop log structures. Densities of fish in the majority of the channel between pools were very low and the smaller size classes of trout and sculpin predominated.

The Hecla channel itself had changed considerably since 1972. Riparian vegetation was well established and provided shade and some cover for the stream in 1984. Several of the drop log structures were in a state of disrepair, especially along the banks, and may fail within a few years if they are not repaired. It appeared that the gradient was sufficient to accommodate additional drop log structures between the original ones. The fish habitat structures placed along the banks throughout the channel were for the most part useless in 1984. The streambed had readjusted to the new gradient and had left most of the structures high and dry or they had been functionally destroyed.

Instream Flows

One additional discharge estimate was made on both Sullivan Springs and Granite Creek during 1984 and staff gauge/discharge relationships were established (Figs. 5 and 6). Staff gauge readings were taken a minimum of twice monthly from mid-August through the end of 1984 to determine the actual amount of water in these two streams on a year-round basis (Table 9). The bimonthly staff gauge readings will continue through 1985 to better establish stream hydrographs in order to meet the requirements of our water rights.

Table 9. Staff gauge readings and discharge estimates in Sullivan Springs and Granite Creek. Pend Oreille Lake drainage. Idaho, 1982-1984.

Date	Sullivan Springs		Granite Creek	
	Staff gauge	Discharge (cfs)	Staff gauge	Discharge (cfs)
6-15-82	1.00	9.95	1.14	70.66
7-23-82	.97	8.70	.62	17.98
8-31-82	.95	7.46	.47	10.66
7-26-83	.96	7.54	.70	28.20
8-31-83	.98	7.27	.51	13.12
9-9-83	.96	6.92	.--	.--
10-26-83	.94	5.85	.40	8.97
5-18-84	.98	8.52	1.14	70.76
8-14-84	.98	.--	.50	.--
9-21-84	.96	.--	.42	.--
9-28-84	.95	.--	.42	.--
10-7-84	.93	.--	.40	.--
10-15-84	.94	.--	.42	.--
10-25-84	.97	.--	.43	.--
11-7-84	.98	.--	.46	.--
11-15-84	.98	.--	.51	.--
11-20-84	.99	.--	.58	.--
11-23-84	.98	.--	.58	.--
11-26-84	.98	.--	.57	.--
12-3-84	.98	.--	.55	.--
12-10-84	.98	.--	.64	.--
12-13-84	.98	.--	.61	.--
12-22-84	.96	.--	.54	.--

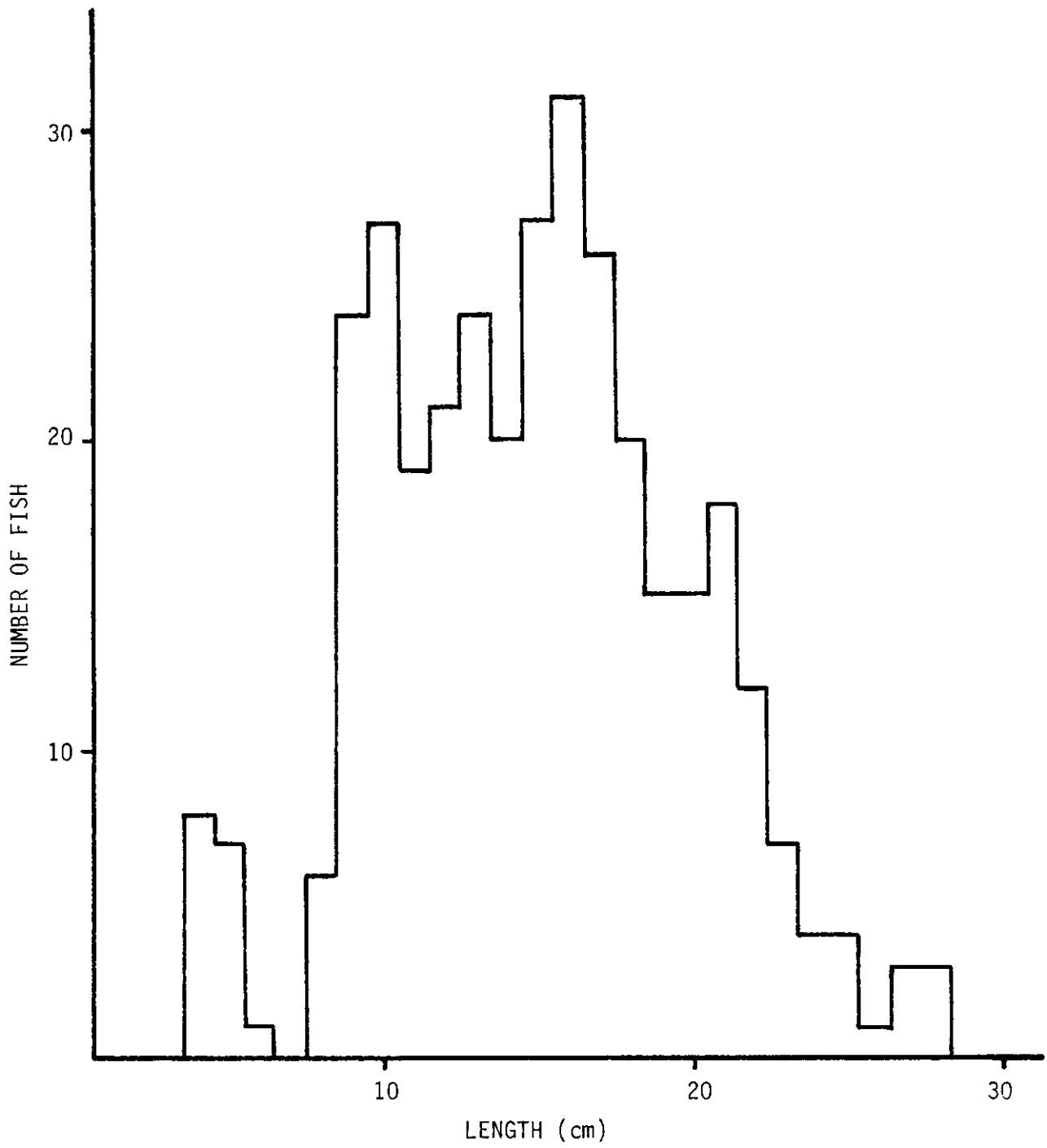

Figure 4. Length frequency of fish collected in the reconstructed portion of the South Fork Coeur d'Alene River adjacent to the Hecla Mining Company settling ponds above Mullan, Idaho, August 29, 1984.

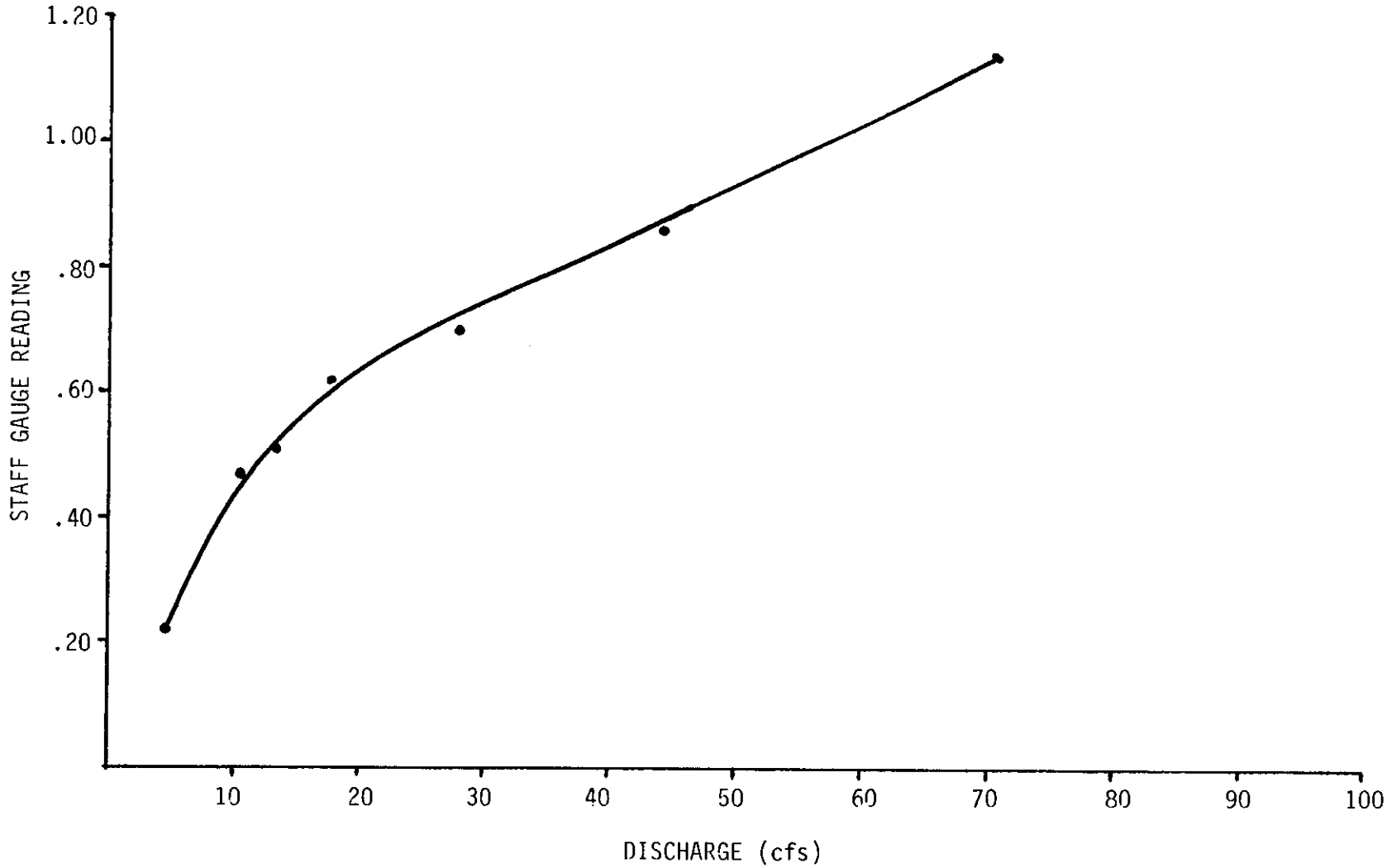

Figure 5. Staff gauge/discharge relationship for Granite Creek, Pend Oreille Lake drainage, Idaho.

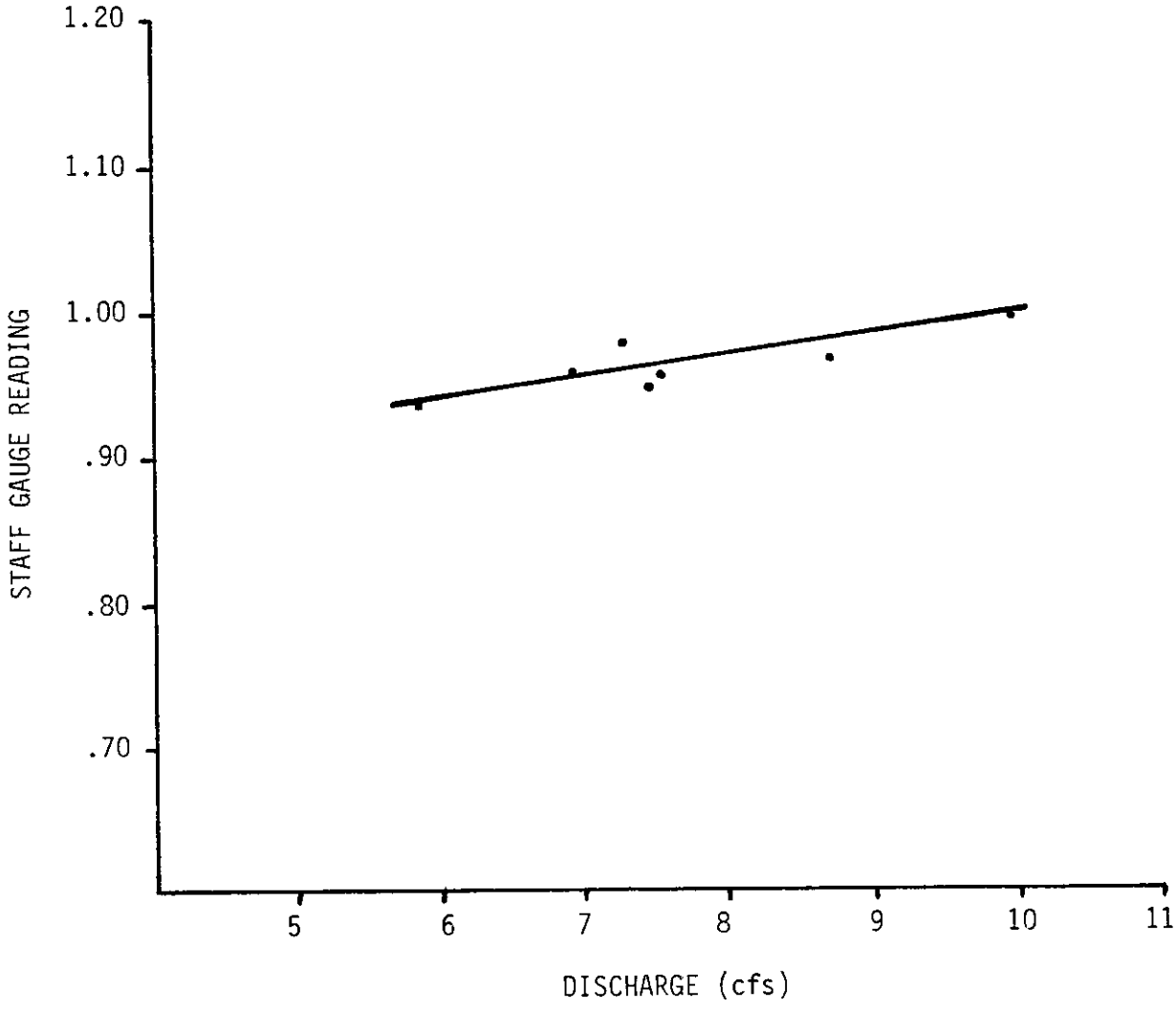

Figure 6. Staff gauge/discharge relationship for Sullivan Springs, Pend Oreille Lake drainage, Idaho.

Staff gauge/discharge readings were continued on Wolf Lodge Creek in 1984, but this data and the previous two years of data are now unusable because the landowner removed the staff gauge from his bridge. We relocated the staff gauge approximately 1 km upstream and will establish a new staff gauge/discharge relationship and hydrograph.

Management and research personnel also assisted Idaho Department of Lands personnel at Priest Lake with instream flow measurements on Indian and Lion creeks. A flow of .74 m^3/s (26 cfs) was determined as the flow necessary to protect fishery values in Indian Creek from the mouth upstream to the confluence of the North and South forks (Fig. 7). A flow of .62 m^3/s (22 cfs) was determined as the flow necessary to protect fishery values In Lion Creek from the mouth upstream to the confluence of the South Fork (Fig. 8).

Kootenai River

Kokanee

Counts of kokanee spawners in selected Kootenai River tributaries were low again in 1984 (Table 10). The 1984 counts were probably not peak numbers but do indicate a declining trend in recent years.

The closure of Ball, Boundary, Long Canyon, Mission, Myrtle, Parker, Smith and Trout creeks in 1982 eliminated a very popular fishery in the Bonners Ferry area and generated a lot of public concern. In an effort to maintain a local kokanee fishery, we requested kokanee eggs from Canada to initiate a small scale enhancement program. To date, surplus eggs from the Meadow Creek channel have not been available and prospects for the future do not look bright. The kokanee population in Kootenay Lake is declining and all hatchery production will be needed to prevent Kootenay Lake kokanee stocks from collapsing.

Prespawning adult kokanee were abundant in the mainstem Kootenai River during June through September in recent years. Some anglers were learning how and where to catch these fish, and catch rates were good. To further increase fishing opportunity for kokanee, Boundary Creek was proposed and approved to be reopened during the 1985 fishing season. The rationale for reopening Boundary Creek to kokanee fishing was that high densities of kokanee in the mainstem Kootenai would continue to result in pioneering of new spawning areas. Reduction of the spawners in one tributary may not eliminate the run if stray fish replace them. Continued monitoring of the kokanee populations and fisheries in the Kootenai River and its tributaries will be needed to determine the fate of the fish population and fishery.

Table 10. Estimates of spawning kokanee salmon in tributaries of Kootenai River, Idaho. August 15, 1984.

Stream	Number observed	Comments
Parker	70	From Morter's gate downstream 650 m, temp 14.5 C.
Long Canyon	17	From below west side road to that gradient section (about 500 m), temp. 15 C.
Smith	130	Westside road bridge upstream to falls, temp. 15 C.
Boundary	55	About 250 m around county road access, temp. 16.5 C.
Mission	24	Counted three pools adjacent to old KV railroad bridge, temp. 16.5 C.
Myrtle	4	Westside road bridge upstream to falls, temp. 15 C.

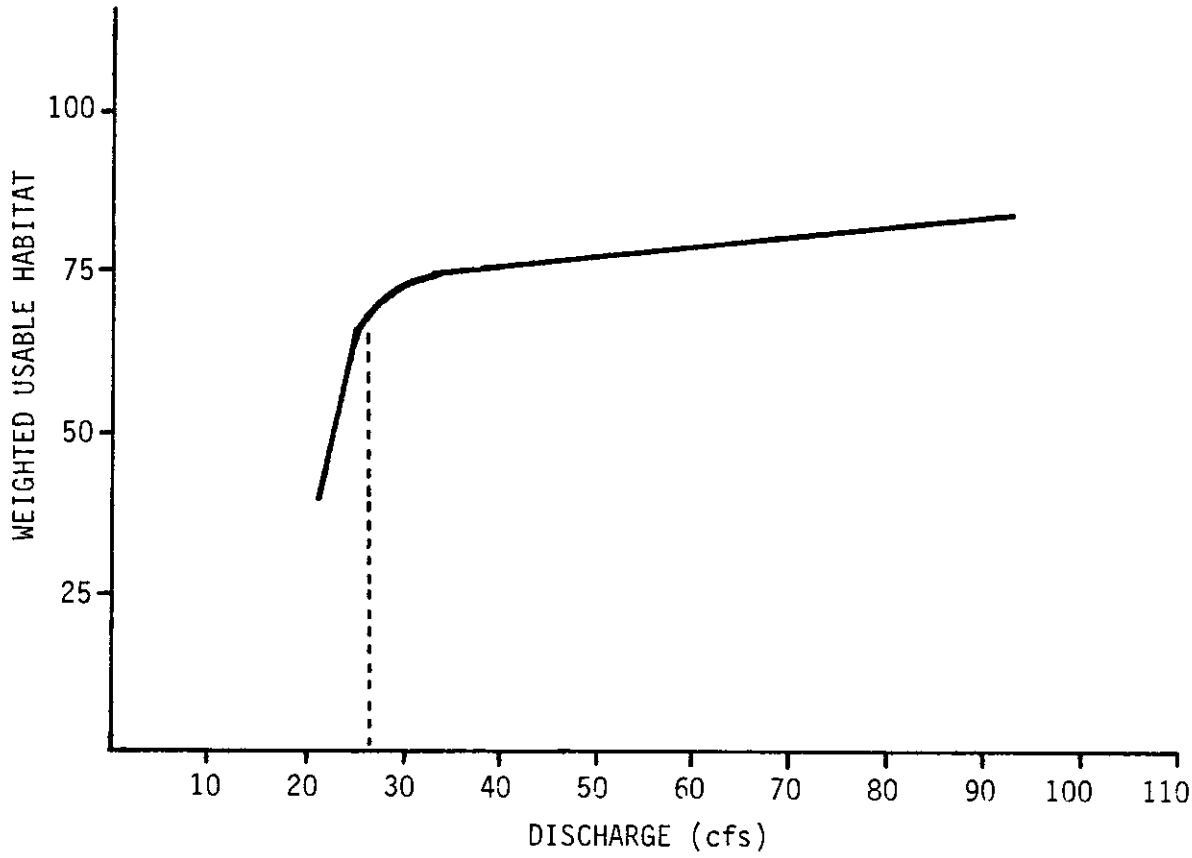

Figure 7. Weighted usable habitat (juvenile cutthroat trout) versus discharge for Indian Creek, Priest Lake drainage, Idaho.

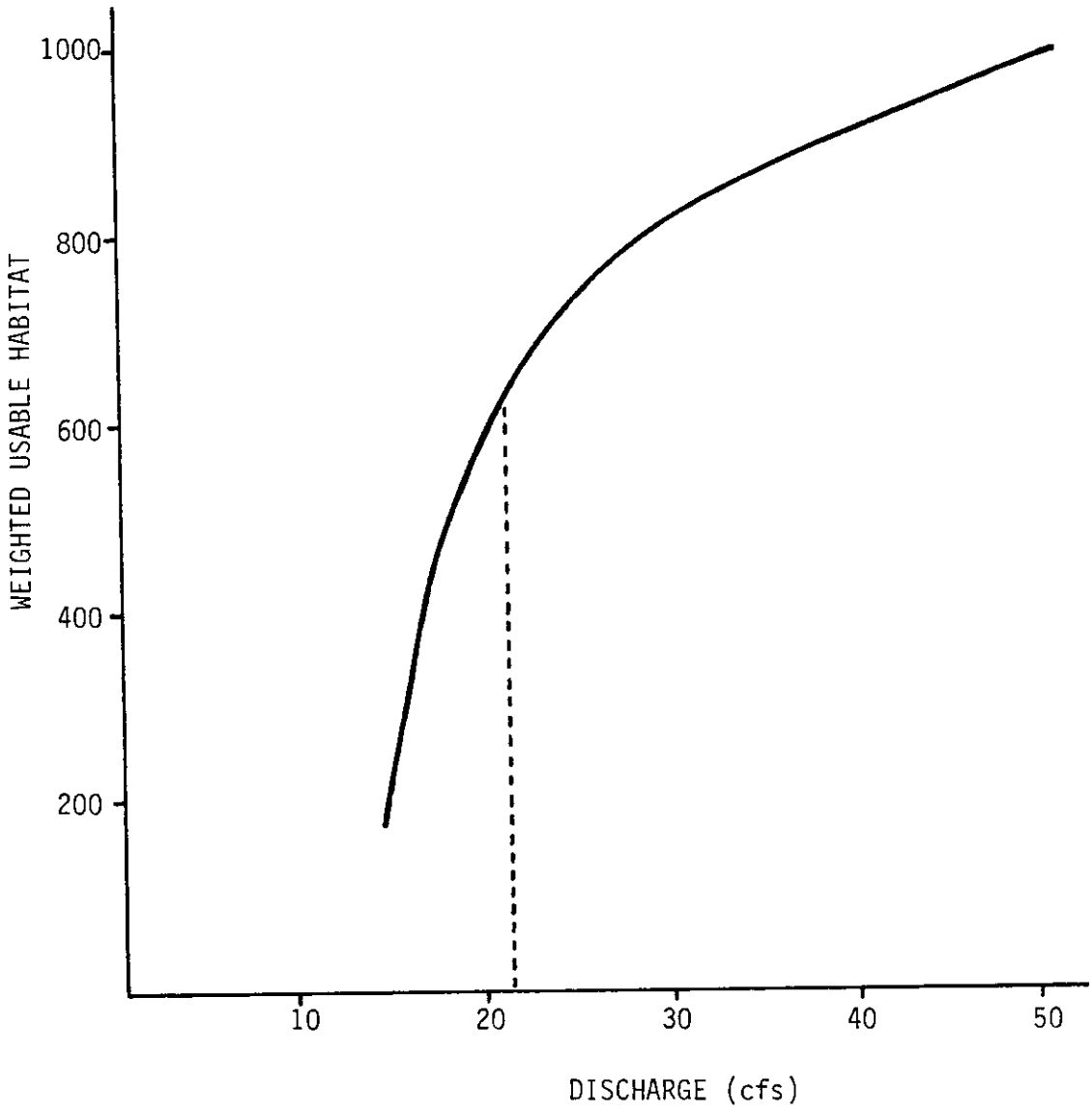

Figure 8. Weighted usable habitat (juvenile cutthroat trout) versus discharge for Lion Creek, Priest Lake drainage, Idaho.

Moyle River

Surveys in 1975 and 1978 suggested that large releases of hatchery fish combined with relatively low fishing pressure resulted in excellent trout fishing in past years (Goodnight, 1978). Lack of juvenile trout recruitment from Idaho tributaries was identified as a problem, but no quantification was made. Goodnight (1978) suspected that tributaries in British Columbia were providing the majority of wild rainbow for the Moyle River in the United States. Recent concern by anglers prompted additional research during the summer of 1984 to gather sufficient information to make appropriate management decisions. A project was initiated with the following objectives:

1. Determine the relative quantity and quality of spawning and rearing habitat in the Moyle River and its tributaries.

2. Determine the species composition and relative abundance of fish in the Moyie River and its tributaries.

3. Assess age at maturity and growth rates for wild Moyie River rainbow trout.

4. Recommend management actions to improve the Moyie River trout fishery.

We collected fish in portions of the lower ends of Moyie River tributaries with a Coffelt BP-1C backpack electrofisher. The fish were anesthetized, measured for total length and released. Electrofishing in the mainstem Moyie did not prove feasible with the equipment available, so we collected fish for age, growth and maturity information with fishing tackle. Maturity was determined in the field, and age was determined from scales taken from the caudal peduncle area of the fish. Scale impressions were made in soft plastic laminate and read on a scale projector. Length-at-age was determined from measurements off a center line down the long radius of the scale.

We snorkeled several areas of the mainstem Moyie River to determine species composition, relative abundance and the distribution of wild trout. A general assessment of habitat quality and quantity was made during our electrofishing and snorkeling surveys. We interviewed anglers at random for catch and catch rate infomation.

Habitat

We did not have time to complete exhaustive habitat surveys in the Moyie River or its tributaries, but several observations are worth noting.

MaInstem Moyle River

The Moyie River originates at the outlet of Moyie Lake and flows 93 km through British Columbia and 43 km through Idaho before it enters the Kootenai River (Fig. 9). A 25 m high natural falls and dam 3 km from its mouth blocks all access from the Kootenai River. The Moyle River Valley follows the Leonia Fault line and lies between very ancient (2 billion years old) metasedimentary rocks that have been uplifted and tilted at a steep angle. This unique geology results in a river of many different characteristics and, therefore, fish habitat.

In Canada, the Moyie River alternates between sections of moderate gradient to two very flat gradient sections above and below Irishman Creek (Fig. 9). Current in the flat gradient sections during July 1984 was low, and water temperatures were several degrees warmer. Aquatic macrophyte growth was abundant, and no salmonids were observed in these areas.

From Englishman Creek downstream to Meadow Creek in the United States, the river is largely composed of long, relatively uniform depth runs separated by short riffles and an occasional deep pool. There are very few side channels along most of this reach. Cover in the mainstem is scarce and is provided by deeper water at the head of runs, scattered large boulders and an occasional large tree. Bottom substrate in this section is composed mostly of cobble-sized material in the 10 to 30 cm size range. Spawning-size gravel is very scarce and was observed in scattered pockets behind boulders and in the few side channels. The river from Meadow Creek upstream to Moyie Lake Is very accessible from parallel roads that run most of its length.

The gradient steepens below Meadow Creek, and the flood plain becomes more confined. Habitat in the "canyon" section is much more diverse and is typified by several deep holes interspersed with pocket water, short runs and riffles. The substrate is still largely composed of cobble material, but spawning-size gravel is more abundant in the mainstem below Deer Creek. Some natural mass wasting areas on lower Deep Creek appear to be contributing massive amounts of fine material periodically. Access to the canyon section is restricted to a few areas even though there is an unimproved dirt road paralleling the river on the west bank.

Lower Moyle River

In late August 1984, the City of Bonners Ferry drew the water level down at their dam on the Moyie River near Moyie Springs to apparently do some maintenance work. The resulting rapid drawdown flushed years of accumulated sediment stored behind the dam into the 2.4 km of river between the dam and Kootenai River. Sediment

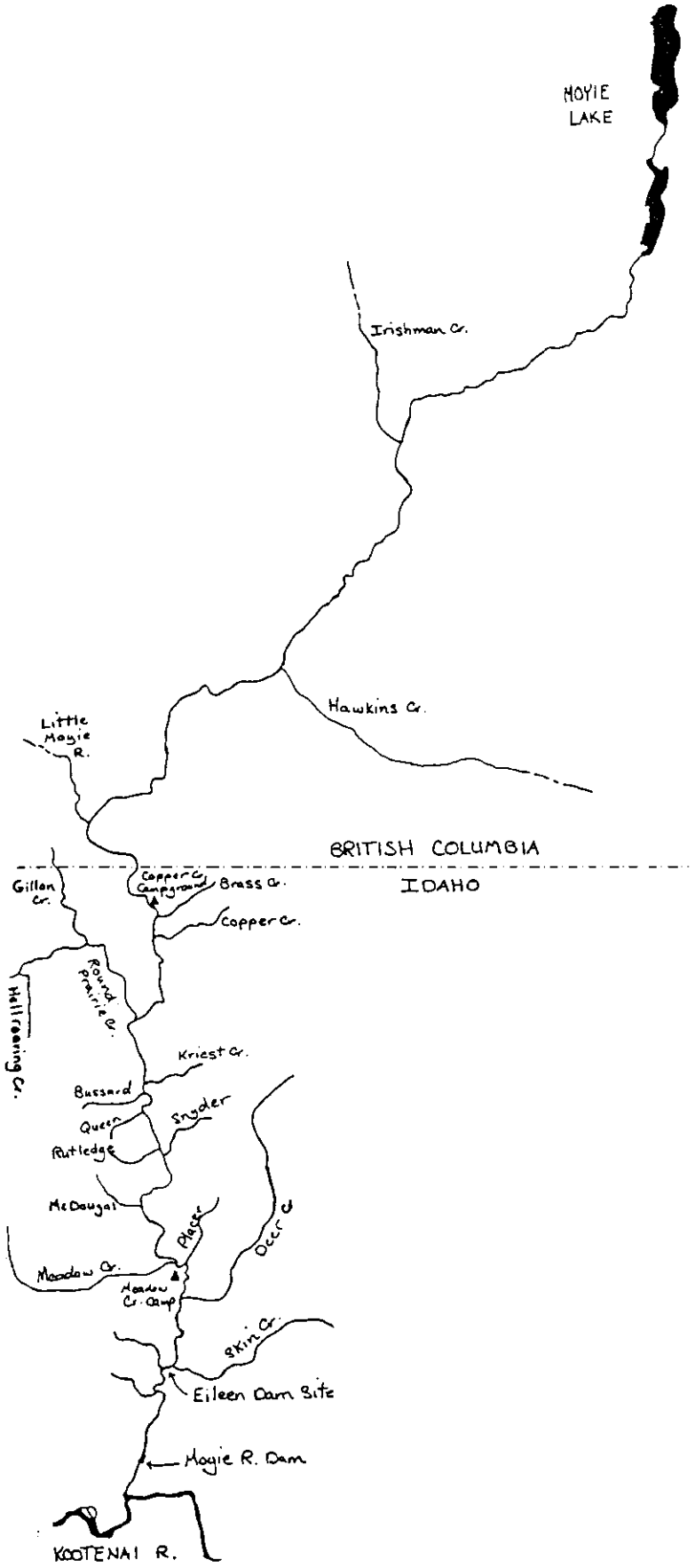

Figure 9. Moyie River drainage within British Columbia, Canada and northern Idaho.

deposits on the formerly clean cobble and boulder substrate were over 1 m deep in places and extended into the Kootenai River. Immediate and sustained losses to the fishery in this area are unknown. Partridge (1983) felt that rainbow trout production was limited by the lack of suitable-sized spawning gravel, but that this area was utilized by mountain whitefish.

No citations were issued by the regulatory agencies involved. Efforts are being made to prevent a recurrence in the future.

Moyle River Tributaries

United States - We surveyed 13 of 20 Moyie River tributaries in the U. S. portion of the river from Deer Creek upstream to the Idaho/BC border (Fig. 9). Only four of these tributaries (Deer, Bussard, Round Prairie and Gillon creeks) appeared to be accessible and potentially useful for fluvial trout. The lower 4.5 km of Deer Creek appeared to contain the most suitable spawning and rearing habitat (Table 11) on the entire Moyle River drainage within the United States.

Canada - We surveyed the Little Moyle River, Irishman and Hawkins creeks in British Columbia. All three tributaries are accessible to the Moyie River. Gradient on all three tributaries is moderate and pocket water type habitat predominated. Substrate material in the areas surveyed were mainly large gravel and cobble with very little spawning gravel present.

Species Composition and Relative Abundance

Mainstem Moyie River

United States - Species observed in the mainstem Moyie River in order of abundance included mountain whitefish (Prosopium williamsoni), largescale sucker (Catostomus macrocheilus), largenose sucker (Catostomus catostomus), rainbow trout (Salmo gairdneri), brook trout (Salvelinus fontinalis), westslope cutthroat (Salmo clarki lewisi), slimy sculpin (Cottus cognatus), longnose dace (Rhinichthys cataractae) and redside shiner (Richardsonius balteatus).

Wild rainbow trout were the most abundant trout species observed (Table 12) and caught in the canyon section of the Moyie River below Meadow Creek. No hatchery rainbow were observed or caught in the upper portion of the canyon even though hatchery fish had been released at the Meadow Creek campground about 2.5 km upstream. Rainbow less than 30 cm were most abundant with 10% or less of the fish observed being greater than 30 cm.

Table 11. Accessibility and suitability of Moyie River. Idaho, tributaries for fluvial trout.

Tributary	Comments
Unnamed	Enters west bank approximately 4 km upstream from Moyie Dam and falls. Suspected steep gradient and/or inaccessible but not surveyed.
Unnamed	Enters west bank approximately 5.5 km upstream from Moyie Dam just below the Eileen Dam site. Suspected steep gradient and/or inaccessible but not surveyed.
Skin	Enters east bank approximately 6.5 km upstream from Moyie Dam or .5 km upstream from Eileen Dam site. Inaccessible 7 m high falls at mouth.
Deer	Enters east bank approximately 2.5 km below Meadow Creek campground. Lower 5.3 km is accessible with moderate gradient and pocket water habitat predominating. A few short bedrock canyons at reach breaks. Substrate is mostly large gravel/cobble with more fines in lower 1.5 km from large natural mass wasting areas on north bank. Bedrock chute just below Placer Road connection that may be a migration block at high flows. Moderate gradient for 16.5 km above bedrock chute with channel alternating between braided, beaver dam controlled areas and pocket water type habitat.
Placer	Adjacent to Meadow Creek Campground entering on east bank. Alluvial fan migration block at mouth.
Meadow	Just upstream from Meadow Creek Campground entering on west bank. Impassable culvert 400 m from mouth is blocking approximately 16 km of relatively high quality spawning and rearing habitat.
McDougal	Enters west bank about 4.8 km above Meadow Creek campground. Railroad and road culverts at the mouth block all access.

Table 11. Continued.

Tributary	Comments
Snyder	Enters east bank about 1 km above Twin Bridges. No migration blocks but very small and intermittent.
Rutledge	Enters west bank about 2 km above Twin Bridges. Alluvial fan at mouth and lower .5 km dry when surveyed in mid-July.
Queen	Enters west bank about 3.2 km above Twin Bridges. Suspected small intermittent stream but not surveyed.
Bussard	Enters west bank about 1 km below Bussard lake access road. Alluvial fan at mouth but probably accessible at high flows. Lower .5 km of stream accessible but minimal habitat available.
Kriest	Enters east bank about .5 km below Bussard Lake access road. Flat gradient beaver dam area and possible railroad culvert block at mouth.
Feist	Enters east bank .3 km above Bussard Lake access road. Intermittent and very small.
Round Prairie	Enters west bank about .5 km below Good Grief Bridge. Very low gradient throughout most its length. Several beaver dams in lower end. Appears to be accessible, but not being used by fluvial fish.
Gillon	Tributary to Round Prairie Creek entering north bank near Robinson lake. Part of the flow is diverted into Robinson Lake. Gradient is mostly low with some moderate gravel substrate sections. Culvert at Robinson Lake Campground was replaced in 1983 to pass fish. Some areas with good spawning and rearing habitat but no evidence of use by fluvial trout during 1984 survey.

Table 11. Continued.

Tributary	Comments
Hellroaring	Tributary to Round Prairie Creek entering south bank about 10 km from mouth. Intermittent lower end and culvert block on State Highway 95, .3 km from mouth.
Spruce	Enters east bank about .5 km below Addie Bridge access. Alluvial fan at mouth and lower .5 km very unstable channel. No evidence of use by fluvial trout.
Copper	Enters east bank about 3.2 km above Addie Bridge access. Alluvial fan at mouth and 60 m high falls about 1.5 km from mouth. No evidence of use by fluvial trout.
Brass	Enters east bank about 1 km below Copper Creek Campground. Alluvial fan at mouth and steep gradient, very small. Did not survey but suspect no use by fluvial trout.

Above Meadow Creek, hatchery rainbow were more numerous than wild rainbow (Table 12). The hatchery rainbow were concentrated around the release sites, and wild rainbow were found in the more remote, inaccessible areas. Wild rainbow over 30 cm were scarce. Both brook trout and cutthroat trout were relatively scarce.

Trout densities were greatest in the top 50 m of runs and in pools. Very few, if any, trout were observed in most of the long runs that predominate this section.

Canada - Wild rainbow trout were the most numerous trout species observed in the Moyie River below Irishman Creek (Table 12). About 25% of the wild rainbow trout observed were over 30 cm. The presence of a few hatchery rainbow indicated that catchable rainbow stocked in the Moyle River below the border are migrating at least 10 km upstream into Canada (Table 12). Again, the majority of fish were concentrated at the head ends of the runs and in pools where deeper water provided some cover.

Above the slack water areas near Irishman Creek, wild rainbow trout were slightly more abundant than cutthroat trout and brook trout (Table 12). A few large bull trout (Salvelinus confluentus) were observed. About 25% of all trout and char observed in this snorkeling transect were over 30 cm. Juvenile mountain whitefish were very abundant.

Moyle River Tributaries

United States - The lower 4 km of Deer Creek was the only tributary where wild juvenile rainbow trout were observed in any abundance (Table 13). Rainbow trout densities steadily increased from about 5 fish/100m^2 3.5 km above the mouth to about 15 fish/100m^2 near the mouth (Table 13).

An occasional rainbow was collected in lower Meadow Creek, lower Round Prairie Creek, lower Hellroaring Creek and lower Copper Creek (Table 13). The majority of tributaries that supported fish contained resident populations of cutthroat and brook trout.

Canada - All three Canadian tributaries that were surveyed contained a mixture of wild rainbow, cutthroat, brook trout, bull trout and whitefish (Table 13). Generally, rainbow trout were found lower in the drainage near the mouths. It appears that Canadian tributaries are providing some rainbow trout recruitment for the main river, but it is unlikely that these tributaries are producing any significant number of wild rainbow for the U.S. portion of the river.

Table 12. The number of fry, juvenile end adult fish observed in snorkeling transects in Moyle River, Idaho, and British Columbia, Canada, July 1984. Corresponding lengths for age class determination were fry <50 mm, juvenile 50—300 mm, and adult 300 mm+.

Snorkeling location	Lenght of transect	Date	Time	Species	Number of fish observed Fry	Juvenile	Adult	Comments
United States								
2 km below Meadow Creek Campground	100m	7/19	1030	WRb	—	27	3	Visibility 2.5 m
				Ct	—	1	—	
				WF	—	5	1	
Addie Bridge down to mouth of Round Prairie Creek.	3.3 km	7/26	0900-1130	HRb	—	139	—	Weather cloudy during lower half of transect.
				WRb	5	91	5	
				Ct	—	8	—	
				Bk	14	30	2	
				WF	8	200+	16	
				LSS	—	—	65	
				LNS	—	—	50	
Canada								
10 km north of US/Canadian border	2 km	7/24	0930-1200	HRb	—	3	—	Visibility 2 m.
				WRb	—	61	20	
				Ct	—	—	3	
				Bk	—	—	2	
				DV	—	—	1	
				WF	15	150+	24	
				LSS	—	—	130+	
Approximately 5 km above the mouth of Irishman Creek	1 km	7/24	1300-1400	WRb	—	25	4	Transect between very flat gradient sections.
				Ct	—	19	5	
				BK	12	11	2	
				Bt	—	—	3	
				WF	5	150+	5	
				LSS	—	—	20	

[1]Species observed: HRb-hatchery rainbow, WRb-wild rainbow, Ct-westslope cutthroat, BK-brook trout, Bt-Bull trout, WF-mountain whitefish, LSS-large scale sucker, LNS-longnose sucker.

Table 13. The number, size and density [fish/100m^2) of fish observed in tributaries of Moyie River, Idaho, and British Columbia, Canada, by snorkeling and electrofishing, July 1884.

Tributary/ Survey location	Date	Time	Temp[C]	Species[1]	Length (mm) [from electrofishing] N	$\bar{X}$	Range	Observed fish densities [fish/100 m^2] Snorkeling	Electrofishing
UNITED STATES									
DEER CREEK									
7.0 km from mouth (mouth of Keno Cr.)	7/17	1500	18.0	CT	16	123	60-160	5.3	—
				BK	17	94	30-160	6.5	—
				WF	—	—	—	0.85	—
5.3 km from mouth [Placer Rd. connection]	7/17	1700	19.0	CT	12	128	90-230	16.0	—
				BK	14	110	40-150	7.1	—
				RB	1	160	—	—	—
				WF	1	220	—	0.79	—
3.5 km from mouth	7/19	0900	13.0	CT	—	—	—	1.4	—
				RB	—	—	—	5.4	—
2.0 km from mouth	7/19	1000	14.0	CT	—	—	—	0.54	—
				RB	—	—	—	7.0	—
				WF	—	—	—	1.6	—
1.6 km from mouth	7/19	1045	14.0	RB	—	—	—	12.5	—
				WF	—	—	—	4.2	—
200 m from mouth	7/17	1000	15.0	BK	—	—	—	3.4	—
				RB	—	—	—	15.0	—
				WF	—	—	—	3.9	—
PLACER CREEK									
400 m from mouth [shocked 50 m section]	7/17	1030	9.0	CT	12	72	40-120	—	21.8

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Table 13. Continued.

Tributary/ Survey location	Date	Time	Temp(C)	Species[1]	N	Length (mm) (from electrofishing) $\bar{X}$	Length (mm) (from electrofishing) Range	Observed fish densities (fish/100 m^2) Snorkeling	Observed fish densities (fish/100 m^2) Electrofishing
UNITED STATES (CONTINUED)									
MEADOW CREEK									
Mouth to Spokane International RR culvert (culvert 400 m from mouth, shocked 300 m)	7/19	0930	14.0	CT	8	132	90-200	—	—
				BK	22	162	30-320	—	—
				Rb	1	130	—	—	—
				WF	1	180	—	—	—
400 m above RR culvert (shocked 100 m)	7/19	1100	14.5	CT	4	150	130-170	—	—
				BK	5	154	140-170	—	—
2.2 km above RR culvert (shocked 30 m)	7/19	1145	16.0	CT	17	139	20-250	—	—
				BK	24	101	40-200	—	—
MC DOUGAL CREEK									
Mouth to 30 m above Meadow Creek Road (60 m)	7/18	0730	10.0	No fish collected.					
SNYDER CREEK									
Mouth to Meadow Creek Road (200 m)	7/18	0800	12.0	No fish collected.					
RUTLEDGE CREEK									
Mouth upstream 30 m	7/18	0830	—	Stream is dry at the mouth.					
BUSSARD CREEK									
Mouth upstream 100 m	7/18	0930	9.5	CT	5	94	60-140	—	—
				BK	5	126	60-190	—	—

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Table IS. Continued.

Tributary/ Survey location	Date	Time	Temp(C)	Species[1]	N	Length (mm) [from electrofishing] $\bar{X}$	Length (mm) [from electrofishing] Range	Observed fish densities (fish/100 m^2) Snorkeling	Observed fish densities (fish/100 m^2) Electrofishing
UNITED STATES (CONTINUED)									
KRIEST CREEK									
100 m above and below Meadow Creek Road crossing	7/18	1100	11.5	CT	33	98	50-160	—	—
				BK	2	60,110	—	—	—
ROUND PRAIRIE CREEK									
400 m from mouth (shocked 70 m section)	7/26	1230	19.5	BK	30	94	40-230	—	16.0
				RB	3	67	40-120	—	1.6
4.8 km from mouth (near Robinson L. access, shocked 15 m section)	7/26	1130	13.5	BK	24	125	50-260	—	74.0
HELLROARING CREEK									
Shocked pool below Highway 95 between dry sections.	7/26	1000	11.0	CT	3	233	200-260	—	—
				BK	51	111	50-120	—	—
				RB	1	130	—	—	—
				NC	1	90	—	—	—
GILLON CREEK									
3 km above mouth	7/16	1700	12.5	BK	51	94	20-220	30.4	—
SPRUCE CREEK									
500 m above mouth (shocked 100 m section)	7/18	1500	14.0	CT	22	104	50-200	—	—
				BK	6	132	40-200	—	—

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Table 13. Continued.

Tributary/ Survey location	Date	Time	Temp[C]	Species[1]	N	Length (mm) [from electrofishing] $\bar{X}$	Range	Observed fish densities (fish/100 m^2) Snorkeling	Electrofishing
UNITED STATES [CONTINUED]									
COPPER CREEK									
Mouth upstream 70 m	7/18	1715	14.5	CT	3	73	70-80	—	—
				BK	27	68	40-110	—	—
				RB	1	150	—	—	—
				LND	6	78	70-80	—	—
BRASS CREEK									
500 m from mouth	7/16	1900	10.5	Small stream with steep gradient, did not shock.					
CANADA									
LITTLE MOYIE RIVER									
400 m from mouth (shocked 200 m section)	7/23	1615	12.5	BK	5	130	90-200	—	0.83
				RB	2	90,120	—	—	0.33
				WF	2	140,160	—		0.33
3 km from mouth (shocked 150 m section)	7/23	1430	13.0	CT	9	123	70-210	—	1.3
				BK	4	150	100-210	—	0.59
				Bt	2	120,130	—	—	0.30
HAWKINS CREEK									
1 km from mouth (shocked 76 m section)	7/24	1030	13.5	CT	1	90	—	—	0.26
				BK	5	112	70-150	—	1.3
				RB	2	130,150	—	—	0.52
				WF	3	190	180-210	—	0.79
7 km from mouth (shocked 53 m section)	7/24	0845	11.0	CT	37	107	60-180	—	9.5

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Table 13. Continued.

Tributary/ Survey location	Date	Time	Temp(C)	Species[1]	N	Length (mm) (from electrofishing) $\bar{X}$	Length (mm) (from electrofishing) Range	Observed fish densities (fish/100 m^2) Snorkeling	Observed fish densities (fish/100 m^2) Electrofishing
CANADA (CONTINUED)									
IRISHMAN CREEK									
500 m from mouth (shocked 85 m section)	7/24	1445	11.5	CT	1	80	—	—	0.22
				BK	5	134	100-180	—	1.1
				RB	6	97	60-110	—	1.1
				Bt	1	100	—	—	0.22
				WF	1	170	—	—	0.22

[1]CT - Westslope cutthroat trout.
BK - Eastern brook trout.
RB - Rainbow trout.
Bt - Bull trout (Dolly Varden).
WF - Mountain whitefish.
NC - Northern chub.
LND - Longnose dace.

R9AD025DM

Rainbow Trout Age, Growth and Maturity

Age and Growth

A total of 43 wild rainbow trout were collected and aged. Fish ranged from age 1 to 4 and were 11 to 45 cm in total length (Fig. 10). Back calculated length at annulus formation was 98 mm at age 1, 161 mm at age 2, 225 mm at age 3 and 297 mm at age 4 (Table 14, Fig. 11).

Maturity and Hybridization

A total of 22 female and 14 male wild rainbow trout were examined for maturity. We found 17% of the females and 43% of the males to be mature (Tables 15 and 16). The percentage of mature female fish for each age class was 67% for age 4, 33% for age 3, 18% for age 2 and 0% for age 1. The percentage of mature male fish for each age class was 50% for age 4, 25% for age 3, 57% for age 2 and 0% for age 1. Although the sample size was small, it appeared that male fish were maturing earlier than female fish.

About 40% of all the wild rainbow trout examined showed outward signs of hybridization with cutthroat (Tables 15 and 16). Genetically, the percentage is probably higher indicating there is probably not a unique Moyie River rainbow.

Mortality and Creel Census Data

Mortality Estimate

From our limited collection of wild rainbow trout with rod and reel, we were able to make a mortality estimate. Assuming rainbow trout are fully recruited at age 2, total annual mortality (A) was estimated to be 42% (Fig. 12).

Creel Census

Our random checks of anglers on the Moyle River indicated catch rates were around .5 fish/hour for all trout combined (Table 17). Hatchery catchable rainbow provided most of the catch in the accessible upper portion of the river. Our catch rates for wild rainbow in the canyon section of the river were 3.5 fish/hour.

The catch rates we observed fell within the range Goodnight (1976, 1978) found in a stocked (1975) and unstocked (1978) situation (Table 18).

Table 14. Back-calculated length (mm) at age and increment of growth for rainbow trout in the Moyie River, Idaho, 1984.

Age class	Year class	N	1	2	3	4
I	1983	8	98	--	--	--
II	1982	18	97	161	--	--
III	1981	11	94	159	225	--
IV	1980	6	95	160	232	297
Average Length			96	160	228	297
N			43	35	17	6
Increment of Growth			98	64	78	69

Table 15. Maturity data for female rainbow trout caught by rod and reel in the Moyie River, Idaho, August 30 and October 16, 1984.

Species	Length (mm)	Weight (g)	Mature ?	Age
Rb x Ct	380	440	No	4+
Rb x Ct	337	--	Yes	4+
Rb x Ct	311	260	Yes	3+
Rb x Ct	298	--	Yes	4+
Rb x Ct	280	170	No	3+
Rb	250	130	No	3+
Rb x Ct	249	130	No	3+
Rb x Ct	246	120	Yes	3+
Rb	234	105	No	3+
Rb	232	100	No	2+
Rb	225	90	No	2+
Rb	222	--	Yes	2+
Rb	220	100	No	2+
Rb	206	75	Yes	2+
Rb	205	--	No	2+
Rb	204	75	No	2+
Rb	203	--	No	2+
Rb	195	--	No	2+
Rb x Ct	176	--	No	2+
Rb	168	--	No	2+
Rb	141	--	No	1+
Rb	140	--	No	1+

Table 16. Maturity data for male rainbow trout caught by rod and reel in the Moyie River. Idaho, August 30 and October 16, 1984.

Species	Length (mm)	Weight (g)	Mature ?	Age
Rb	367	460	No	4+
Rb x Ct	359	425	Yes	4+
Rb x Ct	314	--	No	3+
Rb	298	--	No	3+
Rb	286	205	No	3+
Rb x Ct	271	190	Yes	2+
Rb x Ct	235	--	No	2+
Rb x Ct	220	100	Yes	3+
Rb	219	100	Yes	2+
Rb	213	--	No	2+
Rb x Ct	210	80	No	2+
Rb	200	60	Yes	2+
Rb	197	--	Yes	2+
Rb	143	--	No	1+

Table 17. Summary of anglers checked on the Moyie River, Idaho, from the Meadow Creek Campground upstream to the Canadian border, July 17 to August 30, 1984.

Number of anglers checked	Total hours fished	Fish caught		Catch rates (fish/hour)
18	22.5	HRb	9	.40
		WRb	1	.04
		BK	1	.04
			Total	.48

Table 18. Angler use and harvest data for the Moyie River from Eastport, Idaho. downstream to the dam near Moyie Springs, Idaho, June 27 to August 30, 1975 and June 24 to August 8, 1978 (Goodnight, 1978).

Year	Angler hours	Wild Rb	Hatchery Rb	Brook trout	Other game fish	Total game fish	Game Fish per hour
1975	4,362	446	3,229	216	66	3,957	0.91
1978	1,232	361	0	64	65	490	0.40

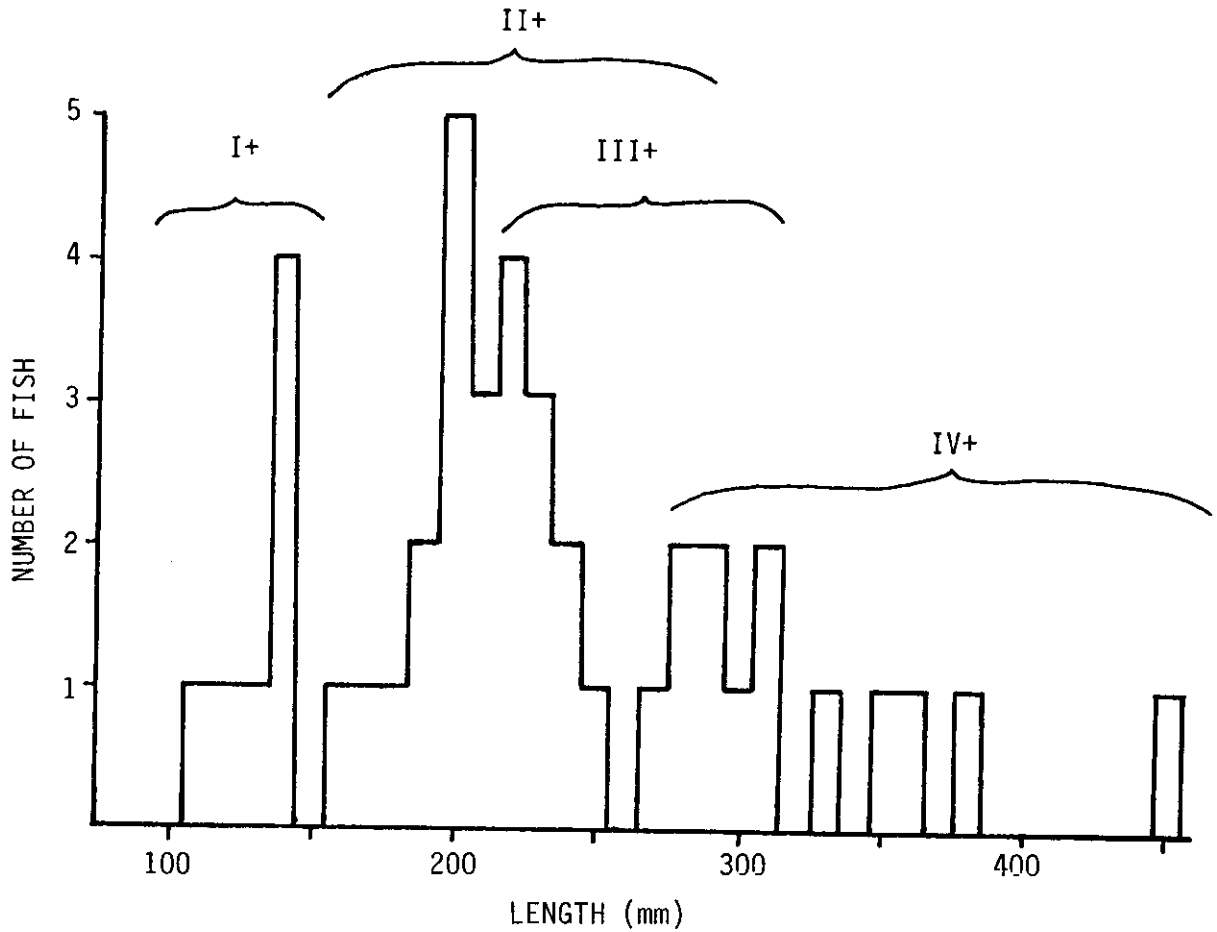

Figure 10. Length and age frequency of rainbow trout caught in the Moyie River, Idaho, 1984.

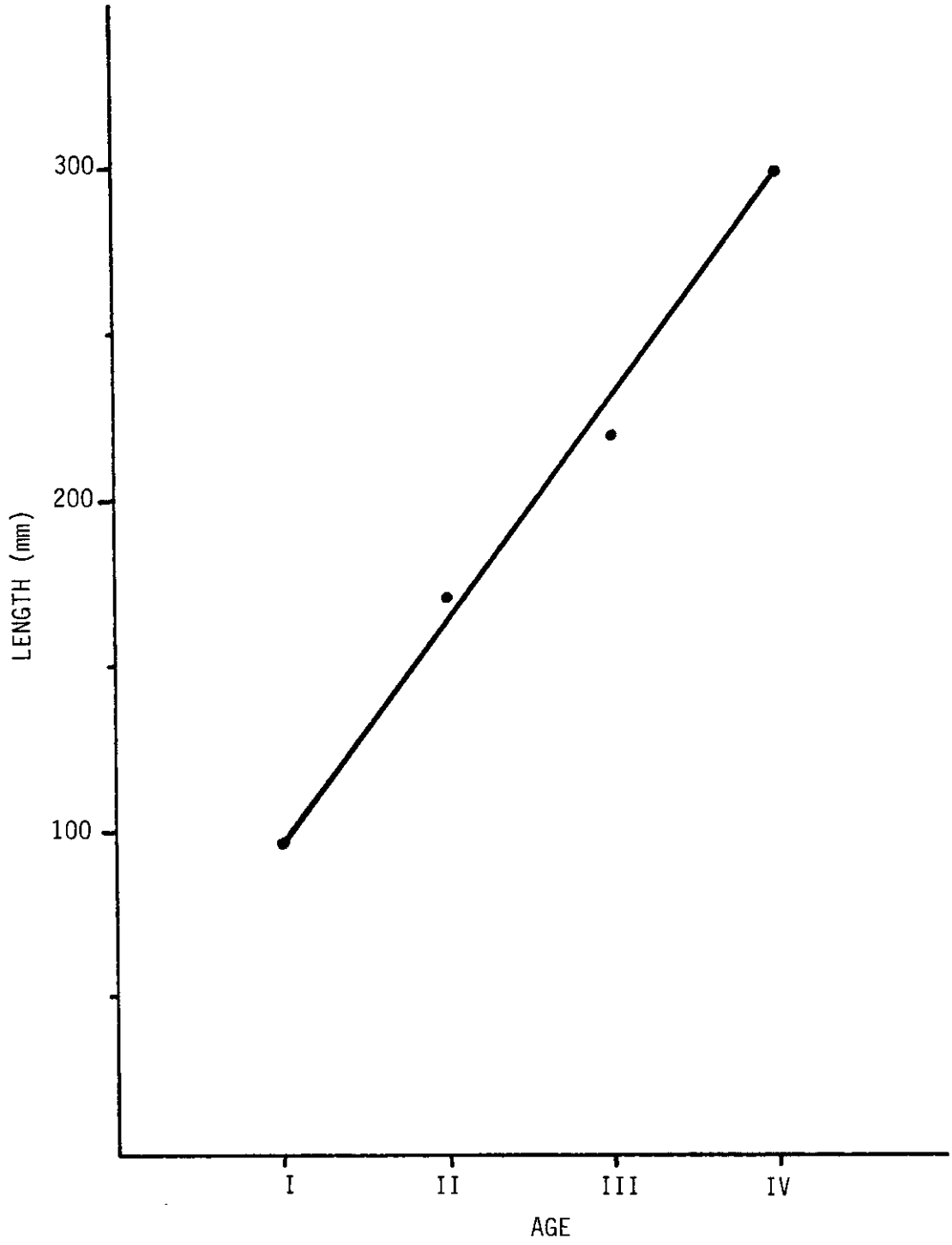

Figure 11. Back calculated length (mm) at age for rainbow trout caught in the Moyie River, Idaho, 1984.

Stocking History

Releases of large numbers of catchable and subcatchable-size rainbow trout in the Moyie River during the 1940's through the mid-1970's (Table 19) are believed to have supported the fishery (Goodnight, 1978). Cessation of stocking in 1977 lead to a decrease in angler effort, harvest, and catch rates (Table 19). Goodnight (1978) recommended that 5,000 catchable rainbow be stocked annually during the season and stocking below Meadow Creek be discontinued.

The Moyie River was not stocked from 1977 through 1982 and poor fishing and complaints from the angling public resulted. Stocking of hatchery catchables was resumed in 1983 (Table 19), and we have now recommended the Moyie receive 8,000 catchables annually.

In addition to unspecified catchable rainbow, we released 15,640 age 1+ Kootenai River stock rainbow into the upper part of Deer Creek in the hopes of establishing a future run that could bolster the wild rainbow population. These fish are progeny of rainbow obtained from a tributary to Libby Reservoir in Montana. They are apparently well adapted to large river environments and mature at age 3 to 5.

Discussion

The Moyie River should be managed as two separate sections due to the variability in habitat and access. Tributary and mainstem spawning and rearing areas between Eastport, Idaho and Meadow creeks are insufficient to support an abundant wild rainbow trout population. This section is typified by long runs of relatively uniform depth. Instream cover from boulders, trees or deep water is lacking. The upper section is readily accessible and contains two developed and several undeveloped campsites. Hatchery catchable rainbow trout will have to be stocked to provide a fishery with acceptable catch rates.

The canyon section of the Moyie River from Meadow Creek downstream to the dam also lacks tributary and mainstem spawning and rearing areas but appears to be producing sufficient numbers of wild trout to support a moderate fishery without stocking. The lower 4 km of Deer Creek and scattered areas in the mainstem below Deer Creek are probably the only remaining production areas. Before Meadow Creek was blocked in 1956, this drainage probably produced the majority of trout for the lower Moyle. Correction of this barrier would access about 16 km of high quality spawning and rearing area but would cost $100,000 to $200,000.

Habitat in the canyon section of the river is more diverse. Large deep pools are separated by pocket water, shorter runs and short

Table 19. The number and size of hatchery-reared rainbow trout released into the Moyie River, Idaho, from 1947-1984.

Year	Species	Number released	Size
1947	Rainbow	50,000	3-7"
1948	Rainbow	20,330	4-8"
1949	Rainbow	35,780	4-6"
1950	Rainbow	23,000	3-10"
1951	Rainbow	20,400	6-7"
1952	Rainbow	4,300	8-10"
1953	Rainbow	10,700	4-11"
1954	Rainbow	12,720	6-12"
1955	Rainbow	19,250	6-11"
1956	Rainbow	20,985	7-12"
1957	Rainbow	14,960	6-10"
1958	Rainbow	23,600	6-10"
1959	Rainbow	12,600	6-9"
1960	Rainbow	22,800	6-12"
1961	Rainbow	16,000	7-10"
1962	Rainbow	12,175	7-12"
1963	Rainbow	11,575	5-10"
	Kamloops	6,927	6-9"
1964	Kamloops	2,555	5-14"
	Rainbow	15,943	6-12"
1965	Rainbow	20,245	8-9"
1966	Kamloops	6,745	12"
	Rainbow	8,385	9"
1967	Kamloops	3,848	8"
	Rainbow	4,335	10"
1968	Rainbow	14,380	6"+
1969	Rainbow	18,370	6"+
1970	Rainbow	11,068	6"+
1971	Rainbow	12,400	6"+
1972	Rainbow	12,275	6"+
1973	Rainbow	4,400	6"+
1974	Rainbow	7,000	6"+
1975	Rainbow	14,585	6"+
1976	Rainbow	12,925	6"+
1977	Not stocked	--	--
1978	Not stocked	--	--
1979	Not stocked	--	--

Table 19. Continued.

Year	Species	Number released	Size
1980	Not stocked	--	--
1981	Not stocked	--	--
1982	Not stocked	--	--
1983	Rainbow	7,023	7-12"
1984	Rainbow	9,935	7-11"
	Kootenai rainbow (released into Deer Cr.)	15,640	3-4"

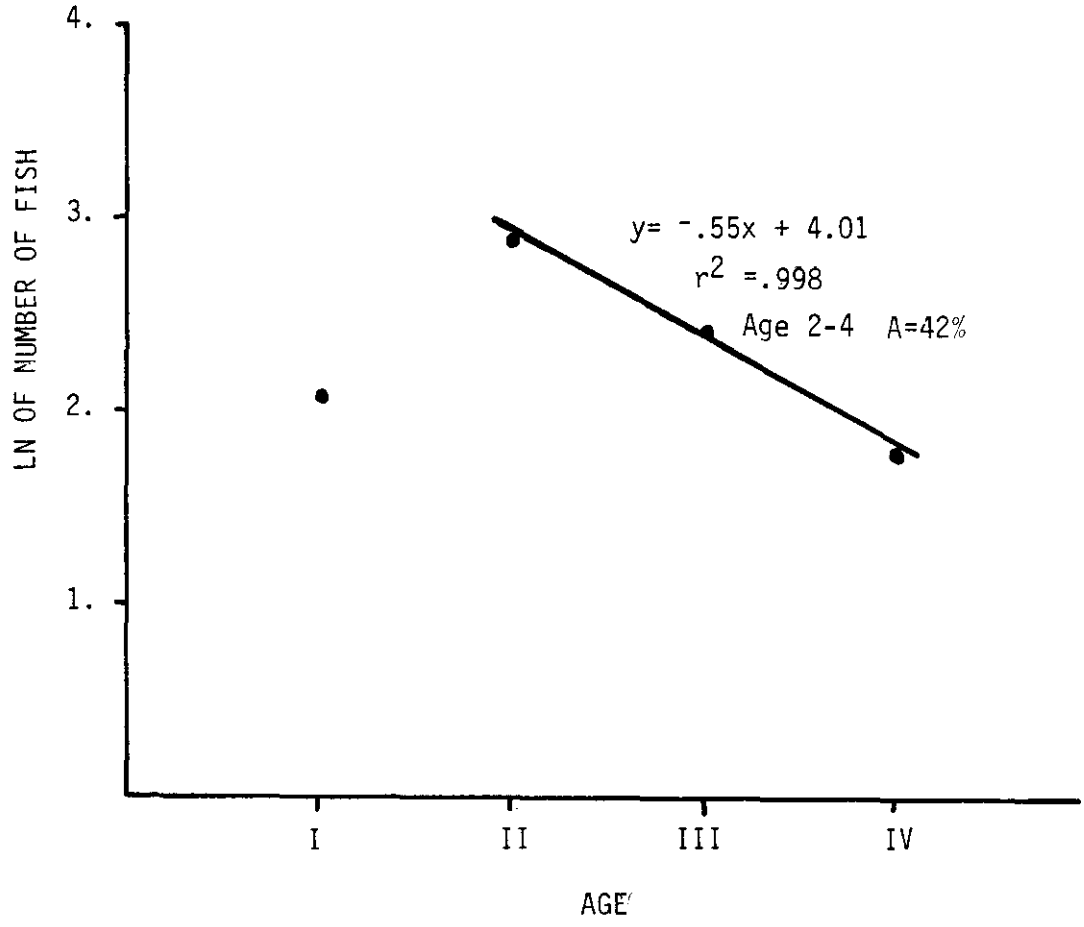

Figure 12. Catch curve for rainbow trout in the Moyie River, Idaho, 1984. Total annual mortality (A) is estimated using age 2 as the point of recruitment.

riffles. Deep water cover is more abundant and it appears that this section of river can support higher densities of fish.

Access to the canyon section is also very limited relative to the upper section. The river is not visible from the unimproved dirt road paralleling the river and private land bordering the river limits access. If access is improved or fishing pressure increases, it is likely that this section of river would also not be able to sustain an acceptable fishery without supplemental stocking.

The wild rainbow trout populating the Moyle River do not appear to be "unique" or necessarily desirable in terms of their life history characteristics. Hybridization with cutthroat is very common and age at maturity is variable and often early (age 2). Growth rates are relatively low and predictable in the low (35 micromhos) conductivity water. The existing wild rainbow trout will probably continue to provide mainly 20 to 30 cm fish and an occasional 40 to 50 cm fish.

Grouse Creek Instream Flow

Grouse Creek represents one of the most important spawning and rearing tributaries to Pend Oreille Lake (Pratt, 1985). It supports especially high densities of rainbow trout and may be the single most important rearing area for the trophy Gerrard rainbow in the entire basin. The Department applied for an instream maintenance flow on lower Grouse Creek, and that application is now pending before the Idaho Water Resource Board. The initial application does not cover all of the critical habitat. New water diversions for irrigation and small hydroelectric generation may threaten maintenance of the habitat. In 1984, as part of the Pend Oreille tributary research project, an instream maintenance flow requirement was determined using the IFIM methodology (Fig. 13). An instream flow request of 18 to 60 cfs was prepared for the creek (Pratt, 1985) and should be submitted to the Water Resource Board for formal consideration.

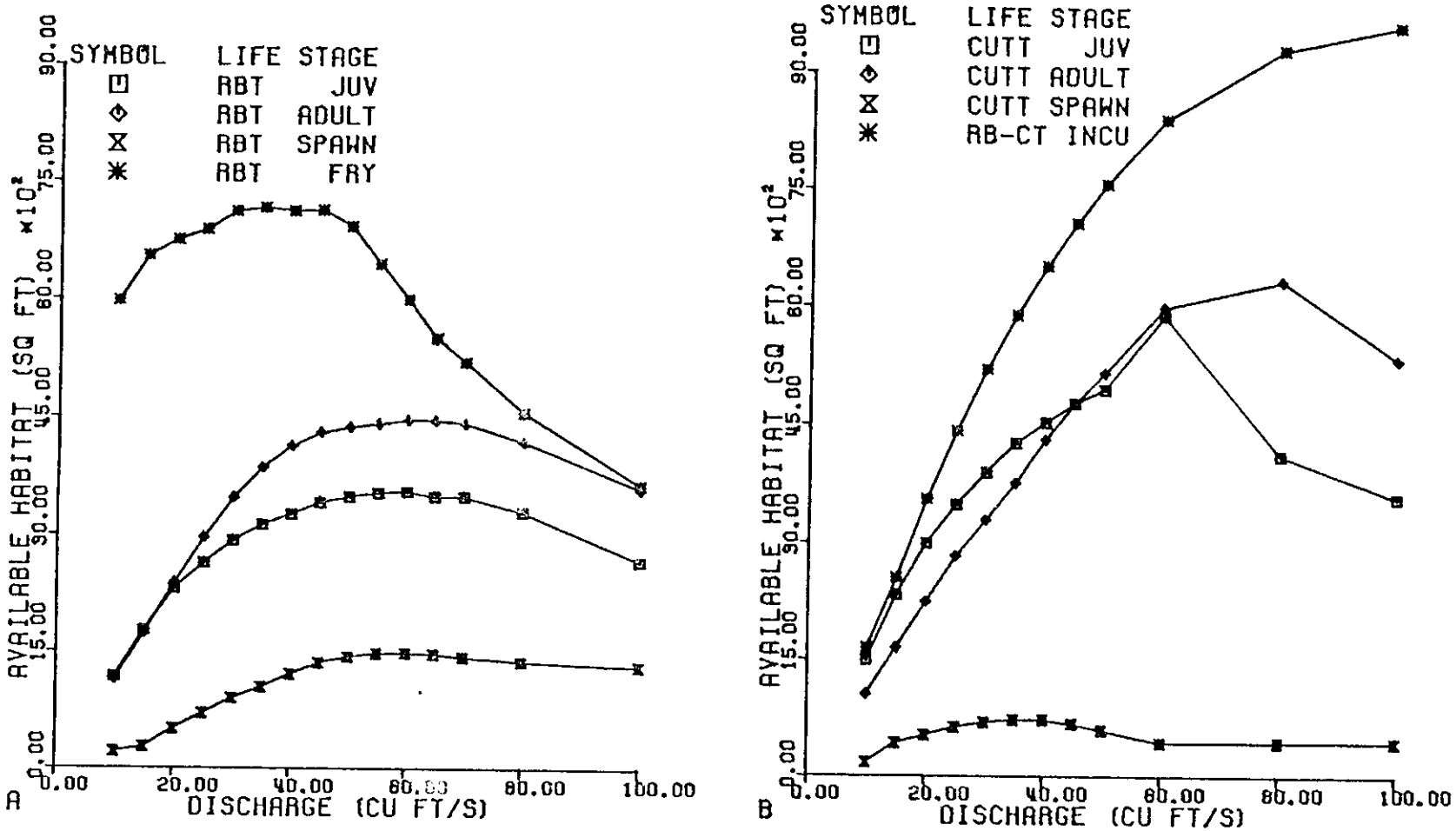

Figure 13. Discharge available habitat relationships developed through IFIM for lower Grouse Creek from the confluence of the North Fork to the County Road Bridge.

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A P P E N D I C E S

APPENDIX A

Information packet and mail-in survey for evaluation of angler preference In new regulations for the Coeur d'Alene River.

Dear Angler:

We are considering new fishing regulations for the Coeur d'Alene River. We need your help if we are to provide the best fishing possible. Without angler support, no regulation can provide the benefit in fishing it is intended to provide.

During this summer, we will be contacting as many anglers as possible to determine their preference for future management of these streams. Attached, you will find a brief discussion of the fishery and a description of management alternatives that may be considered. If you are concerned about the Coeur d'Alene fishery, please read this information carefully. Look at the alternatives. On the last sheet, check the alternative or alternatives you feel most appropriate or provide your suggestions. Return that sheet to us in the stamped, self-addressed enveloped.

The information collected in this survey will be summarized this summer in consideration of fishing regulations for 1985.

Thank you for your help.

Sincerely,

David S. Neider
Regional Supervisor

Attachment

The Coeur d'Alene River system supports a unique population of wild trout, the westslope cutthroat. These fish are native to most lake and river systems of northern Idaho and have provided excellent fishing for anglers throughout the region in the past. Unfortunately, these fish are very susceptible to heavy fishing pressure and to environmental degradation. Development of our forests and increased access and fishing pressure have resulted in the decline of many of these populations throughout the northwest. It is still possible to provide excellent cutthroat fishing, but often it is necessary to use very restrictive regulations to do that. The high quality fishing found on the upper St. Joe River, Kelly Creek, the Lochsa River and others are examples of that sort of fisheries management.

In 1976, special fishing regulations (3 fish, none under 13") were imposed on portions of the Coeur d'Alene River in an attempt to stop the decline of cutthroat and hopefully improve the fishery. Recent research shows that our objectives were met only in part. The decline of the population was stopped, but the fishery has not improved as dramatically as we expected. Several factors may be responsible for the failure of the population to rebuild.

First, the death rates for fish in the population have not declined under the new regulations. Fishing pressure may simply be too great.

Second, growth rates of cutthroat in the main Coeur d'Alene River are much better than we had originally anticipated. Cutthroat are growing beyond the 13-inch protected size before many of the fish are old enough to spawn. As a result, many of the cutthroat are harvested by anglers before they spawn for the first time, and the production of young fish is less than what is needed to rebuild the population.

Finally, much of the important spawning and rearing habitat found in the small tributary streams has been degraded by development. There may be only a limited amount of that very critical habitat left. If that is the case, the protection of spawners is even more important to insure adequate production of young fish.

The Coeur d'Alene is a productive river. It has the potential to provide much better fishing, at least in some areas, than we have at present. To do that, we will have to rely on production of wild fish. We simply cannot afford to plant enough hatchery fish to support fishing in any more of the river than we do now. To produce more and larger wild fish, we must overcome the problems mentioned. New regulations should do that, but the support and interest of anglers that fish the Coeur d'Alene will be critical to get the job done. In earlier surveys, anglers indicated that they favored management of parts of the Coeur d'Alene River for wild cutthroat using special regulations. We want to know if that is still the case. If it is, we want to know whether anglers want to try more restrictive regulations in an effort to increase the numbers and size of wild cutthroat available.

We believe there are several alternatives that are feasible. In all cases, we would anticipate staying with general fishing regulations (6 fish, no size limit) in the lower portions of the main river (below Yellow Dog Creek) and the North Fork (below Laverne Creek).

Please read these alternatives closely and select the one or ones you most prefer or suggest other alternatives you think should be considered.

ALTERNATIVES

1. No change in present regulations - General limit (6 fish, no more than 2 over 16": no minimum size limit) below Yellow Dog Creek and Laverne Creek. Special regulatIon (3 fish, none under 13") above Yellow Dog Creek and Laverne Creek.

Under this alternative, fishing would remain very similar to what you experience now. Fishing would be supported primarily by hatchery catchables in the lower sections, and present numbers of wild cutthroat in special regulation areas. As development and fishing pressure continue to increase, the wild trout fishing could begin to decline.

2. Go to general regulations in the entire Coeur d'Alene River system, or increase the amount of general regulation on the main Coeur d'Alene River or the North Fork.

Under this alternative, available hatchery catchables would be planted throughout the accessible fishing area. Wild cutthroat would likely decline to very low numbers. Fishing for catchables would be limited by the expense and survival of those fish

3. In the current special regulation areas, retain the 13" minimum size limit, and reduce the bag limit to one fish.

This alternative may reduce the current harvest somewhat. This type of change could emphasize the critical nature of cutthroat harvest and may encourage anglers to abide by the regulations. With current levels of fishing pressure, it is unlikely that this regulation by itself could result in any dramatic change in fishing.

4. Increase the minimum size limit in the current special regulation areas. To provide necessary protection for spawning fish, the limit would probably need to be 15 inches.

This regulation would protect more spawners, allowing the population to increase in numbers. After several years, large numbers of cutthroat should become available to anglers. Fishing should be similar to that found on the upper St. Joe River with the exception that fish commonly caught and released by anglers would be one to several inches larger. Fish large enough to keep would be available, but not abundant. This change would result in a dramatic increase In the population only if all anglers abide by the regulation.

Growth rates in the North Fork are not as good as that in the main river. Because of that, the average fish caught would be smaller and legal fish would be rare in the North Fork. Numbers of cutthroat could increase dramatically, however.

5. Go to catch and release fishing in the special regulation area of the main Coeur d'Alene River or in small sections of that area. Smaller sections that might be considered are the Teepee Creek-Independence Creek drainage or the main Coeur d'Alene above Teepee Creek.

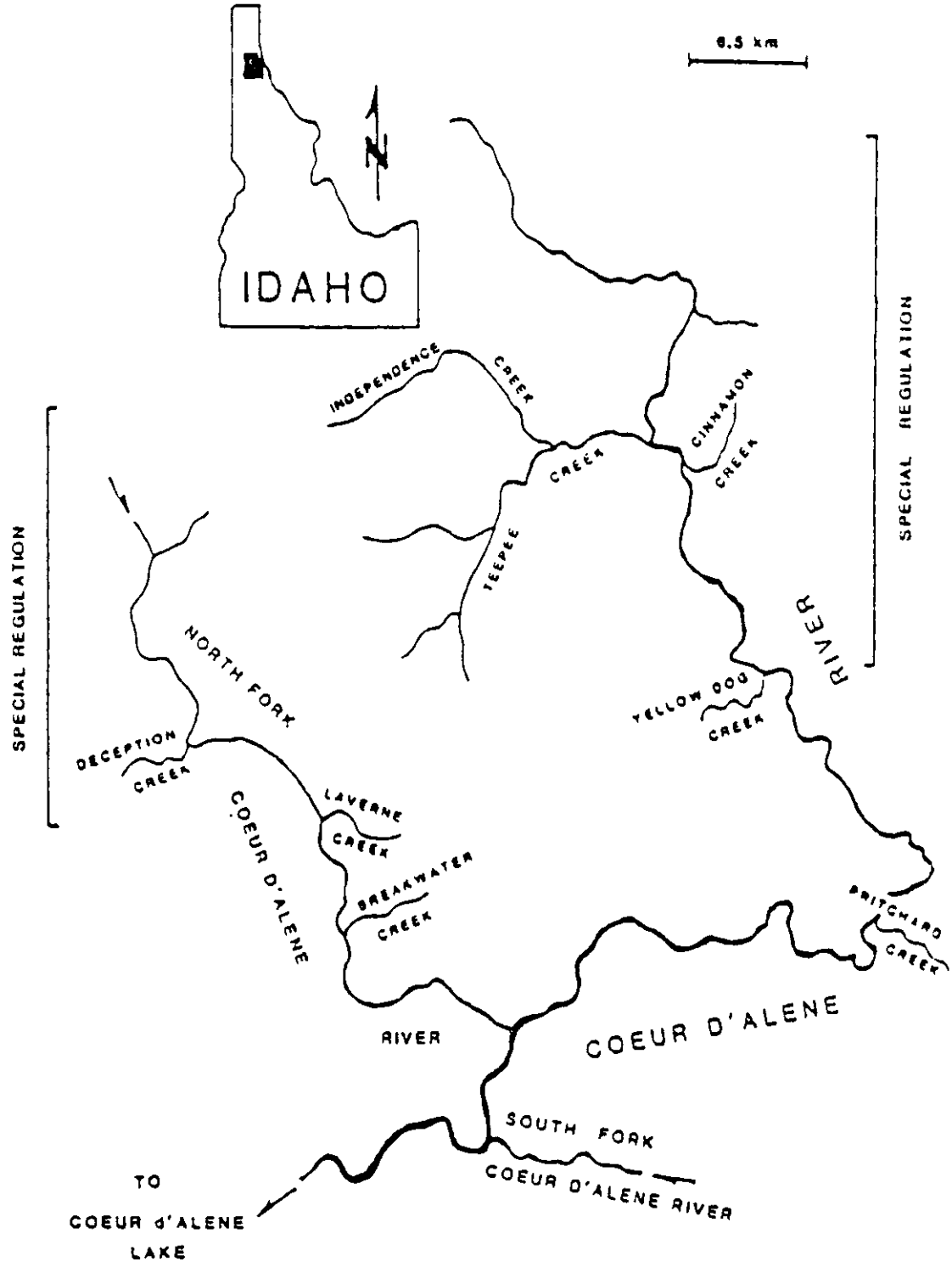
This kind of regulation would maximize the potential catch rates and size of fish available to anglers. Obviously, it would mean fishing for sport only, allowing no harvest and no fish in possession while in the restricted area. Because of the high growth rates, fishing for cutthroat could be as good or better than in any other North Idaho cutthroat stream where special regulations have been used. This change would not result in a dramatic increase in number of size of fish if anglers did not abide by the regulation.

6. Close portions (Teepee Creek or main River above Teepee Creek) of the special regulation area on the main Coeur d'Alene River for several years (2 to 4) and then re-open under a restrictive regulation (catch-and-release or 15" size limit).

This kind of regulation would maximize the number and size of cutthroat available in the shortest possible time. By eliminating fishing entirely, the population would rebuild as rapidly as possible. This kind of change could be more easily enforced and likely would have fewer problems because of failure of anglers to abide by the closure. If habitat loss in the drainage has become critical, this regulation may not provide as dramatic a response as anticipated.

We cannot predict with certainty the response any of these regulations will have. We believe there is good potential for more and larger cutthroat in the system, but a maintenance of habitat and angler support of any new regulation will be critical.

Please select the alternative or combination of alternatives that you feel are most appropriate for future management of fishing in the Coeur d' Alene.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COEUR D'ALENE
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PLEASE SELECT YOUR PREFERRED ALTERNATIVE(S). LIST YOUR SUGGESTIONS AND RETURN TO US IN THE ATTACHED STAMPED, SELF-ADDRESSED ENVELOPE.

ALTERNATIVE

_____ 1. No change.

2. Increase the general regulation area.

_____ a. Whole system.

_____ b. Main Coeur d'Alene River.

_____ c. North Fork.

_____ 3. One fish limit.

_____ 4. Increased minimum size limit.

5. Catch-and-release fishing.

_____ a. All main Coeur d'Alene above Yellow Dog Creek.

_____ b. Teepee-Independence creeks.

_____ c. Main Coeur d'Alene above Teepee Creek.

6. Complete closure and re-open with more restrictive regulation.

_____ a. Two years.

_____ b. Four years.

_____ c. All main Coeur d'Alene above Yellow Dog Creek.

_____ d. Teepee-Independence creeks.

_____ e. Main Coeur d'Alene above Teepee Creek.

7. Other suggestions.

JOB PERFORMANCE REPORT

State of: Idaho

Project No.: F-71-R-9

Job No.: Job 1-d

Name: REGIONAL FISHERY MANAGEMENT INVESTIGATIONS

Title: Region 1 Technical Guidance

Period Covered: 1 January 1984 to 31 December 1984

ABSTRACT

Region 1 management personnel provided private individuals, organizations and state and federal agencies with technical guidance, review and advice on projects associated with or having impacts on the fishery resource or aquatic habitat in Region 1. The guidance included written comments on 153 documents.

Authors:

Bruce E. Rieman
Regional Fishery Manager

Ned J. Horner
Regional Fishery Biologist

RECOMMENDATIONS

1. The loss of aquatic habitat due to land use development, stream and lake encroachment and pollution is a continuing and expanding problem. Current demands for technical guidance and the level of involvement necessary to suitably influence these proceedings exceed the time management personnel are able to contribute. This type of activity is critical to slow the continual loss of aquatic habitat, but does not directly benefit the angling public by providing any enhancement through management of existing fisheries. To accomplish both the habitat protection and the more intensive fishery management necessary under increasing demand, additional manpower is necessary. At least one additional biologist is needed to begin developing a drainage basin approach to fisheries management in Region 1.

2. Appropriate technical guidance to protect lands associated with streams while minimizing damage to aquatic habitat has been unavailable. Development of a booklet detailing alternatives for stream stabilization should be considered. A cooperative effort between the Department of Water Resources and the Soil Conservation Service may be useful. In the meantime, the Department of Water Resources should be encouraged to take a more active role in technical guidance or referral.

OBJECTIVES

To impact land use decisions in Region 1.

To provide other agencies and individuals with technical guidance and assistance pertaining to the fishery resources of Region 1.

To furnish technical assistance, advice and comments to other agencies, organizations or individuals regarding any items, projects, or activities that are associated with or may have an impact on the fishery resource or aquatic habitat of the Region.

To comment on environmental Impact statements, provide input regarding timber sales, highway construction, stream alterations, EPA discharge permits, dock and boat basin development, gas and electrical transmission lines, land use planning and other environmental impacts.

TECHNIQUES USED

Through personal contact, project and document review and field inspections, we made comments and provided advice on projects or activities associated with or impacting the fishery resource or aquatic habitat of the region.

FINDINGS

During 1984, Region 1 fishery management personnel responded to 153 written requests for comment from various agencies as follows:

U.S. Army Corps of Engineers	13
U.S. Forest Service	23
U.S. Environmental Protection Agency	8
Idaho Department of Lands	34
Idaho Department of Transportation	4
Idaho Department of Water Resources	33
Miscellaneous	38
TOTAL	153

Numerous presentations and programs were made to civic and sportsmen groups throughout the year.

In addition to routine comment and technical guidance, a number of issues required considerably more effort and involvement by regional personnel.

Interstate 90 Reconstruction

Reconstruction plans for Interstate 90 along Cedar Creek and Fourth of July Creek were an important issue in 1984. The Department of Transportation has agreed to reconstruct all stream crossings up to at least the South Fork of Cedar Creek. To establish passage for adfluvial cutthroat, bridges will replace existing culverts. In addition, they have also proposed to provide passage to the upper portion of Cedar Creek if feasible. If passage cannot be provided to Upper Cedar, instream habitat improvements will be made in the South Fork of Cedar Creek to compensate for the inaccessible habitat. Negotiations for mitigation in the Fourth of July drainage are not complete. It appears, however, that further mitigation in Fourth of July may be dependent on repair of a passage block at the mouth. An irrigation pump station owned by the local irrigation district and the SCS blocks movement of cutthroat at some flows. Negotiation with those groups has not been successful.

BPA - Power Line Construction

The Bonneville Power Administration will begin construction of the Idaho section of a new 500 k.v. transmission line in 1985. The line will cross the South Fork, North Fork and main Coeur d'Alene drainages and the Hayden Creek drainage. The project will involve a large amount of new road construction and reconstruction. Much of the activity will be in drainages deferred from development by the Forest Service because of sediment problems with existing roads. The project will also impact the water supply for the Mullan Hatchery. We spent a considerable amount of time working with the Panhandle Forest to develop a monitoring and mitigation plan for the project. As part of the agreement developed, BPA will fund a 10-year monitoring study of construction impacts. The first two years of the project will be conducted by the Department. Mitigation agreements include habitat work in several drainages, best management practices in construction activities and reconstruction of the Mullan Hatchery water supply. In addition, any impacts demonstrated in the monitoring program will be mitigated in the future.

Small Hydro Protects

Hydropower proposals view activities on a number of streams during 1984 including Marble Creek, the St. Marles River, Riser Creek, Trout Creek, Long Canyon Creek, Smith Creek and Cascade Creek. License applications were submitted to FERC on both Smith Creek and Cascade Creek. We spent time submitting study requirements, providing consultation and field review for each of these projects. Time was also spent in negotiation of maintenance flows and mitigation for the two projects under application.

Forest Service

We reviewed and provided comments on a number of preliminary and final EAs for Panhandle Forest timber sales. Several sales will have significant impact on fishery resources, and time was spent in negotiation with both District and Supervisor's office staff to address our concerns. We were able to obtain significant concessions in mitigation packages and have been successful in elevating the concern for fisheries resources. Timber harvest activities remain as the major concern in habitat loss in the Region, however.

Bunker Hill - Wolf Lodge Lawsuits

During 1984, we provided technical support and information for legal proceedings in two lawsuits. Biological Information on the Wolf Lodge cutthroat population and angler effort data dependent on that population were summarized for a lawsuit involving the 1983 gasoline spill and fish kill. We also participated in the development of a restoration plan and Justification of losses for a lawsuit involving historic impacts of the Bunker Hill mining and smelting operation on fish and wildlife resources.

Submitted by:

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Regional Fishery Biologist

Bruce E. Rieman
Regional Fishery Manager

Approved by:

IDAHO DEPARTMENT OF FISH AND GAME

Jerry M. Conley, Director

Monte R. Richards, Chief
Bureau of Fisheries

Virgil K. Moore
Resident Fishery Manager